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AVIATION AND COSMONAUTICS

No 10, October 1988

AF Chief Engineer Discusses Performance of Aviation Engineer Service

91441096a Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 10, Oct 88 (signed to press 6 Sep 88) pp 1-3

[Article by Col Gen Avn V. Shishkin, chief engineer of the Air Forces: "Aviation Engineer Service and Combat Readiness"]

[Text] The resolutions of the 19th All-Union CPSU Conference and the party's firm policy directed toward acceleration of socioeconomic development and renewal of all aspects of Soviet society and at ensuring reliable national defense have been accepted enthusiastically by Air Forces personnel.

Our party, as is confirmed by the decisions of the 27th CPSU Congress and the resolutions of the 19th All-Union Party Conference, is devoting unabating attention to matters of defense organizational development. Today it should be ensured predominantly by qualitative parameters both in respect to equipment, military science, strength and composition of the Armed Forces, which should guarantee the reliable security of our socialist homeland and its allies. Soviet defense doctrine and the principle of sufficiency for reliable defense of the Soviet State, upon which it is grounded, focuses precisely on this task.

For the men of the aviation engineer service combat readiness is a quite specific term and concept and consists primarily in maintaining aircraft in a condition whereby they can be brought in a minimal time to a state of readiness to perform complex missions and ensures a high degree of effectiveness of aircraft employment in the process of flight training.

Scientific and technological advances are expanding capabilities to design and build aircraft with excellent combat performance characteristics. Aircraft handling and flying performance characteristics and increased aircraft payload have brought the Air Forces to a fundamentally new stage of sophistication.

In recent years qualitative changes have occurred both in the design and construction of aircraft and in the composition and structure of aircraft equipment. These changes have led to increased influence of aviation engineer support on the end results—combat flying and weapons delivery. In the past engineer and technician personnel for the most part maintained aircraft in proper working order and readied them for flight operations, while accuracy characteristics were entirely determined by the proficiency and skill of the aircrews.

Today's aircraft is different. The tasks of guiding an aircraft to the target area and aiming at the target are performed by automated systems containing complex computer hardware. Engineer and technician personnel feed basic input data into the integrated bombsight, weapons targeting and navigation systems prior to aircraft mission departure. Results of weapons delivery depend in large measure on the quality of performance of this operation as well as how weapons targeting and aiming systems have been tuned and adjusted. Therefore the responsibility of aviation engineer service specialist personnel for ensuring equipment accuracy has become commensurate with the responsibility of the combat aircrews.

Thus at the present stage aviation engineer support in the interests of combat readiness consists not only in maintaining aircraft in good working order and mission-readying them, but also in performing tasks of direct combat employment of an aircraft. In the final analysis, as experience indicates, an aircraft's capability to destroy its assigned targets depends on accuracy of adjustment, alignment and preparation of targeting and aiming systems.

A great deal is being done to ensure excellent qualitative parameters of aircraft and aircraft armament in the units in which Majs V. Meleshchenko and V. Savkov serve as deputy commander for aviation engineer service. On the basis of experience and know-how acquired during performance of their internationalist duty in the Republic of Afghanistan, they have developed a smoothly-working system of tuning and adjustment of integrated bombsight, weapons targeting and navigation systems. Efficiency innovators rigged up special airmobile carts carrying the requisite equipment for promptly feeding compensating corrections into weapons targeting and aiming systems. The men also make skillful use of airborne weapons delivery monitoring and recording devices, employing a process and procedure devised by efficiency innovators under the guidance of Lt Col N. Butenko.

Obviously no matter how sophisticated the equipment at the disposal of our Air Forces, it is essential that aircrews and aviation engineer service personnel possess thorough knowledge and mastery of the aircraft. But this can be achieved only with well-organized personnel engineering and technical training. Otherwise air mishaps and mishap-threatening situations as well as a decline in the level of aircrew combat readiness are inevitable.

In the military unit in which Maj V. Suchkov serves, for example, air near-mishap situations occurred which involved incorrect operation of aircraft weapon systems in flight. Insufficiently solid professional skills were also revealed when this unit was inspected by the higher-echelon commanding officer. During the inspection two crews failed to accomplish their weapons delivery mission at the range due to ignorant, unskilled manipulations of cockpit equipment.

At the same time there are also many examples in the units of a high level of organization of engineering and technical training and proficiency. In the Air Forces units in which Lt Col G. Zlobin and Maj M. Averchenkov serve, modern, well-equipped classrooms and laboratories have been set up, and airborne and ground simulator equipment is being fully utilized. Full-scale working models and scaled-down models are extensively employed to improve aircrew skills in operating cockpit equipment. They are also intensively utilized to check aircrwe readiness to perform specific in-flight operations. In order to gain an understanding of the operating principles of control systems and weapons, flight personnel take part in readying aircraft for live-fire training sorties.

The contribution of engineers and technician personnel to successful combat mission performance has increased greatly in connection with major qualitative changes in improving aircraft and armament. At the same time the existing organizational structure of the aviation engineer service and the rate of growth of professional competence of aircraft maintenance personnel have remained unchanged, and realization of the steadily increasing capabilities of modern aircraft systems is being achieved with great difficulty. This problem must be resolved without delay, since it is closely linked with further improvement in the combat readiness of Air Forces units and combined units.

We are placing considerable hopes on adoption of a comprehensive engineer and technician personnel job training system. It will make it possible to intensify the training process on the basis of adoption of new combat training methods and differentiated training programs with utilization of modern technical devices. Great importance is being attached to improving professional knowledge by periodic refresher training of military aviation engineers at Air Forces higher educational institutions, as well as conversion-training flight personnel to unfamiliar aircraft.

The large and important tasks of the current training year connected with mastering complex aircraft and adopting effective modes of their combat employment are imposing increasingly greater demands on quality of Air Forces aviation engineer support and on training and indoctrination of aviation engineer service personnel. The engineer-technician personnel job training system which has become established over the last several years is no longer adequate today for accomplishing these tasks sufficiently effectively and with high quality. At the present time training and preparation of service school graduates to perform their job duties in line units lacks adequate directional thrust. We have not yet succeeded in full measure in securing a differentiated approach to training, taking into account job category and aviation engineer service personnel proficiency rating.

I feel that primary training and refresher training at Air Forces higher educational institutions and conversion-training to new aircraft should establish a solid foundation of knowledge, while the aviation regiment should continue to be the place where a highly-proficient aircraft maintenance specialist is trained. It is precisely in the line regiment that the knowledge acquired by the engineer or technician is broadened and assumes practical, specific configuration. And those line units in which technical training devices are built, acquired and are being effectively used—training simulators and computers with software, and where combined flight simulators are used to give aviation engineer personnel good working knowledge of the operation of aircraft equipment in the air, are proceeding in the right direction.

An important role in the system of forming and shaping the aircraft maintenance specialist is assigned to an objective evaluation of his knowledge. There should be no unnecessary relaxation of demands or compromise with realism here. The following rule should be adopted: that person who has evaluated level of knowledge bears responsibility for the maintenance specialist he has tested. At the same time it is necessary to give a certain degree of independence to young aviation personnel and to give them greater trust and confidence, while ensuring appropriate monitoring and verification.

Tactical air exercises and special tactical exercises play a special role in development of the aircraft maintenance specialist. Unfortunately an instructive environment is not always created for aviation engineer service specialist personnel at these exercises, where everything boils down to readying aircraft just as on normal flight operations days. I feel that this point must be taken into consideration when planning and conducting exercises, with elements of the new more boldly introduced, while giving exercised personnel the right to display intelligent initiative and innovativeness in carrying out assigned tasks.

Optimization of the volumes of work performed on aircraft to maintain them in proper working order and to ready them for flight activities in the shortest possible time is a most important area for increasing combat readiness. The principle of designating volume and periodicity of inspection and maintenance procedures upon reaching a specified number of hours of operation, practically independently of the operating state and condition of a specific aircraft equipment item, forms the basis of the existing scheduled preventive maintenance system used on fixed-wing and rotary-wing aircraft. This leads to greater labor expenditures than are sometimes needed. This contradictory situation can be corrected by changing over to maintenance based on condition, that is, performance of servicing and maintenance procedures on the basis of an aircraft's operating condition. The principal conditions for this are inspection and maintainability of maintenance-covered items, and modern maintenance procedures.

Analysis of the characteristics of aircraft equipment confirms that it does not fully meet these conditions at the present time. Therefore we can consider only a

partial, where this is possible, changeover to maintenance on the basis of condition, but with continuing the scheduled preventive maintenance system. A complete changeover will be possible only on equipment specially adapted for this system of maintenance.

Diagnostics will play an important role in accomplishing such a critical task, in particular one of the principal areas of diagnostics—further expansion of use of parametric information provided by onboard recording devices. A new method of gas-turbine engine maintenance diagnostics has now been developed in the Air Forces and has gone through certification testing with positive results. An efficient, flexible diagnostic system has been developed using a standard ground and onboard automated test and monitoring system. Performing analysis procedures during time on the ground, it is capable of spotting symptoms of malfunctions and failures at an early stage and can accurately predict the state and condition of a gas-turbine engine.

It is necessary to revise and optimize prescribed servicing and maintenance procedures, to continue persistent efforts to adopt high-productivity means of mechanization, and more extensively to utilize automated systems for checking aircraft flight readiness in an integral process with the measures discussed above.

In order to implement the new approaches to maintenance of modern aircraft, it has become necessary to revise the organizational structure of the aviation engineer service. Scientific studies have confirmed that optimal results are produced by organization of aircraft servicing and maintenance by combined servicing crews comprising the primary aviation engineer service unit, capable of operating independently by the brigade contract method and of performing all aircraft preflight-readying procedures. The work volume is distributed among five or six equally work-loaded routings, and technical procedures on each routing, including checking all equipment powered up, is performed by one servicing crew member. Mastery by each crew member of the procedures on two to three servicing routings ensures servicing crew interchangeability and operational efficiency.

The main points in the new method are as follows: the considerable reserve potential contained in the human factor are mobilized; there is greater collective responsiblity for ensuring that the aircraft assigned to servicing crews are in proper working order and combat-ready; the work tasks of each ground crewman are made specific, with a resulting increase in the role played by the aircraft technician [crew chief] in organizing aircraft preflighting procedures; realistic preconditions are created for seeking progressive, high-productivity military work methods.

Achievement of high end results in strengthening combat readiness is inconceivable without improving aviation engineer service management. The engineer-supervisor plays a determining role in increasing the effectiveness of management activity. He should fully meet the requirements imposed by the party on today's supervisor. "Every person in a supervisory position," the proceedings of the 27th CPSU Congress stress, "should be distinguished by ideological staunchness, a high degree of political knowledgeability, competence, the ability to organize group efforts, to inspire others with personal example, faithfulness to principle, firm moral convictions, a constant need to communicate with the masses and to be committed to people's interests and needs." Proceeding from these points, it is essential to prepare a fully-qualified reserve of supervisory personnel at all levels of the aviation engineer service and boldly to incorporate promising young specialist personnel into this reserve. The following criteria should be applied in all job transfers and reassignments: political and professional qualities, professional competence, abilities, a person's actual accomplishments and attitude toward others.

The modern aircraft is a complex technical system. The efforts of a great many specialist personnel are required for its operation and maintenance. And it is very important that they carry out their assigned duties with a full sense of responsility. Hence a special demand on military discipline and adherence to prescribed job procedures. It should be a focus of constant concern by the engineer-supervisor. Military aviation personnel should play a major role in strengthening military discipline and adherence to orderly procedure, especially in conditions of democratization and glasnost.

Volga MD AF Political Section Chief Gives Perestroyka Progress Report

91441096b Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 10, Oct 88 (signed to press 6 Sep 88) pp 4-5

[Article, published under the heading "Implementing the Resolutions of the 19th All-Union CPSU Conference," by Military Pilot 1st Class Col V. Kuznetsov, Military Council member and political section chief, air forces, Volga Military District: "Commander—Party Ideological Warrior"]

[Text] It was noted at the 19th All-Union Party Conference that perestroyka has created a fundamentally new ideological-political situation in our society. It has become reality and is gathering strength, extending downward and outward. The conference resolutions and the decisions of the July (1988) CPSU Central Committee Plenum enable us to grasp more deeply the ideological essence of the processes which are taking place as a revolution of consciousness and ideological renewal and to perceive the changes which are taking place in the psychological makeup, thinking, style and methods of

the practical activities of administrators, managers, and specialist personnel in various branches and sectors of the economy and the military as a logical consequence of these processes.

The course of perestroyka, which is gathering momentum in the military educational institutions, air units and subunits stationed on the territory of the Volga Military District persuasively demonstrates that the pace of perestroyka and the results achieved to date are superior in those military units in which the ideological conviction, political awareness and knowledgeability of the leader-Communists is most fully manifested in their actions. First and foremost in an effort not just to play at perestroyka or adapt to it in a halfhearted manner but to set about solving the problems facing aviation personnel with the highest degree of responsibility, boldly and resolutely.

The political section approaches precisely from this position the performance of tasks assigned by the 19th All-Union Party Conference. We advise and demand that those who are unclear about how to conduct perestroyka and what specifically should be done begin with themselves, with defining their civic position, stepping up their political and job-related activities, and increasing their responsiblity for the assigned task and end results.

For a period of several years Military Pilot 1st Class Col V. Totskiy served as training regiment commanding officer at the Balashov Higher Military Aviation School for Pilots imeni Chief Marshal of Aviation A. A. Novikov. A man who is highly demanding on himself and his subordinates in all things pertaining to practical implementation of party demands on combat readiness of the Armed Forces and the Air Forces and on the quality of training of flight personnel, and ably relying on the assistance of the political workers, staff officers, subunit commanders, and the party organizations, he has done a great deal to unify the collective and to mobilize the intellectual energies, knowledge, experience and know-how of aviation personnel toward accomplishing assigned tasks. A fine tradition—mishap-free flying—was continued during his command. For more than 20 years now the unit has had no air mishaps. The regiment has unfailingly been and continues to be one of the district's leading Air Forces units in principal combat and political training performance indices and socialist competition results. Recently Col V. Totskiy received a promotion. In his new job he has also proven to be an aggressive party ideological warrior, a skilled leader and organizer. We have many such officers.

The fusion of ideological conviction, knowledge and practical affairs is being manifested increasingly more strongly in the activities of ranking personnel at the Balashov Higher Military Aviation School for Pilots, which took first place among Air Forces higher educational institutions based on last year's performance results. It is gratifying that the aviators at the Saratov Higher Military Aviation School for Pilots placed second, right behing the Balashov people.

In the majority of party collectives leader-Communists are showing greater responsibility for improving flight training and study of theory in conformity with the present demands of the USSR Minister of Defense and the Main Political Directorate of the Soviet Army and Navy on Armed Forces higher educational institutions, including flight schools. For example, all schools are incorporating training on new curricula and flight training courses, which prescribe that pilot cadets shall master daylight flying in IMC, night VFR flying, precision formation flying, flying at low level and up to the aircraft's service ceiling, and that they shall train with new combat flying maneuvers. Military educational institution leader-Communists Majs Gen Avn V. Resnyanskiy and K. Vlasinkevich, Col V. Milyukov, and commanding officers of training regiments and subunits are making a substantial personal contribution toward practical organization of the training and indoctrination process.

We have today entered a phase in our lives and military service when desire and ability to restructure must be proven by specific deeds, a genuine improvement in quality and effectiveness of training and indoctrination work.

Lt Col N. Kochkin has not long been in command of the separate airfield technical support battalion at the Balashov School. As the political section has repeatedly noted, however, the activities of this officer and his subordinates serve as an example of consistent implementation of the party's guideline to the effect that man, with his strong points and shortcomings, his spiritual and intellectual aspirations and material needs, shall occupy the central focus of all organizational and ideological indoctrination work. In this battalion, alongside improvement of the process of political training, a great deal is being done to improve the men's living conditions and availability of services and amenities. The changes which are taking place here do a better job than words of convincing people that perestroyka is moving. And the more actively each individual takes part in it, the faster problems of housing, improving military post facilities, personnel leisure time activities, etc will be resolved.

In short, at all echelons of command and control at military educational institutions, in units and subunits we have leader personnel who by virtue of their ideological, professional and moral qualities are capable of achieving effective accomplishment of the complex and important missions assigned to Air Forces personnel.

As we know, however, commanders, and good commanders in particular, are not born. The process of development of today's officer-leader is complex and multifaceted. A great many objective and subjective

factors influence the development of an Air Force commander's professional, political, and moral-ethical qualities. Of paramount significance among these factors is the effectiveness of ideological training and indoctrination of military leader cadres.

A great deal has been done recently in military educational institutions and units and a great deal is being done to bring ideological and political indoctrination work into conformity with the party's programmatic guidelines, the resolutions of the 19th All-Union Party Conference, as well as current and future tasks assigned to military aviation personnel. Perestroyka is also encompassing organizational forms increasingly more deeply and broadly, but the main thing is the content of ideological activities.

At the same time the political section believes that without new approaches to our work we cannot solve the problems which accumulated during the period of stagnation and which today constitute the foundation of the mechanism impeding perestroyka. Tendencies toward costly, extensive rather than intensive practices in flight activities, excessive situation simplification and excessive relaxation of demands are still observed in a number of units and subunits.

It was emphasized at the 19th All-Union Party Conference that without overcoming negative phenomena it is impossible to move forward successfully and to accomplish the substantial tasks of perestroyka. And first and foremost we must raise the theoretical level of ideological-political work and give it a businesslike, innovative character.

In my opinion one of the main reasons for the still appreciable gap between word and deed, between our plans and reality lies in the slow psychological restructuring of leader and supervisor personnel and ideological workers in the spirit of the party's contemporary constructive approach to solving current pressing international, economic, social, and other problems. I must state quite frankly that some of our commanders lack that persistence, boldness, and self-sacrifice which distinguishes genuine party ideological warriors. I shall endeavor to demonstrate the consequences of waiting tactics with the example of ideological support of aviation personnel's campaign for flight safety.

Analysis of ideological and political indoctrination work in units and subunits where air mishap threatening situations have occurred gives reason to point to a diminished sense of responsibility on the part of certain military unit leader personnel for flight operations safety. Insufficient effectiveness of ideological influence is also evident in the fact that the organizational work done by some commanders to prevent violations of flight rules and procedures frequently boils down to mechanical recording and superficial critique and analysis of near-mishap situations and errors as well as punishment of the guilty parties. The requirements of guideline documents governing flight activities are frequently given mere lip service. This year, for example, approximately one fourth of all recorded near-mishap situations occurred because of shortcomings in organization and direction of flight operations, that is, bear entirely on the conscience of unit and squadron commanders.

Irresponsibility and excessive situation simplification have not been eliminated in training air traffic control teams. For example, for a period of two months alleged duty ATC navigation officer and approach controller training was regularly recorded in the logs in the units in which officers M. Zharkikh and Yu. Sobin serve. And the commanding officers, without giving any thought to it, would place their signatures under these deliberately falsified entries. Flight training and flight operations safety costs were excessive in the units with which party members A. Isavkin, V. Farkhiyev, and G. Sarygin serve.

The impression is created that some leader personnel are unaware or unwilling to acknowledge the dialectical linkage between deficiencies in flight training and in combat training as a whole and their own poor work performance and lack of personal example. We shall cite some more facts. Approximately 20 percent of mishap-threatening situations over an entire year were due to the fault of regimental-echelon leader personnel—from unit commander to flight commander. This category of personnel is held considerably less strictly accountable than the rank-and-file pilots. For example, slightly more than one third of persons guilty of violating flight regulations and procedures were subjected to party discipline.

There is plenty of food for thought here. Freedom from punishment and lack of integrity engender in some leader-Communists an attitude of immunity to normal rules and regulations as well as a conceited attitude, and dull their sense of professional alertness, for which one must sometimes pay dearly.

Of course we are not merely accepting shortcomings and mistakes both in our own work and that of political agencies and party organizations of military educational institutions and units. We are drawing the appropriate conclusions from statements by Comrade M. S. Gorbachev, General Secretary of the CPSU Central Committee, to the effect that today we cannot afford to underestimate the importance of political and ideological-theoretical training and ideological-moral conditioning of cadres.

Higher demands are being imposed on all categories of leader personnel. We are holding most rigidly to account those commanders and other persons in authority who by their conduct both on and off duty and by their unfit work style discredit themselves as officers and undermine their men's faith in the ideals of fairness and decency. For example, subunit commanders officers V. Bushnev, L. Rudenko, and A. Vlasenko were relieved of their duties, and party members V. Ivanov, A. Isavkin, Yu. Nikishin, G. Sarygin, and other leader personnel were meted out severe party and administrative discipline.

We are also performing the task of overcoming stagnation phenomena in personnel work. This applies first and foremost to service schools. It is no secret that at service schools, alongside frequent turnover of commanders in the companies and squadrons, it is no rarity for some individuals to manage to rise in rank from lieutenant to colonel without leaving their duty post, without experiencing duty in Air Forces combat units. They teach and indoctrinate cadets and even, judging from efficiency reports and statements of recommendation, achieve a "practical directional thrust" to the process of forming and shaping the future pilot and Air Forces commander. And yet year after year the same deficiencies are noted in comments on graduates of their school: poor knowledge and, especially, poor skills in political indoctrination work, inability to apply the principle of individual approach in training and indoctrinating their men.

The district command and political section maintain an unequivocal position on this matter: primarily officers with experience in combat units, who have proven themselves as commanders and indoctrinators, should preferentially be appointed to positions of authority at service schools and in training regiments. And we can cite examples.

Former Air Force regimental commander Col V. Sidorov works hard and conscientiously as training section officer at the Orenburg Higher Military Aviation School for Pilots imeni I. S. Polbin. Officers V. Petrov, N. Miroshnichenko, P. Kuznetsov, A. Norko, Sh. Akhshmetshin, V. Mashkin, A. Klinkov and other commanders and supervisory personnel transferred from line units have been assigned to their new positions with promotions.

Enhancement of the role of commanders as organizers of perestroyka, bearers and disseminators of the new thinking and new approaches to accomplishing combat training and indoctrination tasks increases the importance of basic ideological conditioning of leader personnel. For this reason we devote considerable attention to improvement of officer Marxist-Leninist training. The qualitative changes which are taking place in this area are fostering the development of interest on the part of enrolled personnel, a profound, integral understanding of Marxist-Leninist theory and CPSU policy, and a responsible and innovative approach to studying the writings of the founders of Marxism-Leninism and party programmatic documents, avoiding page-by-page recitation and rote citing of quotations.

The problems method of teaching, the dialogue form of lectures and seminars, practical and situational games, and elements of the methodology of V. Shatalov and other noted innovator-educators are being actively incorporated into officer Marxist-Leninist training, and particularly into the training of leader personnel of military educational institutions and units. Today this work is being better organized in the Air Forces units in which officers V. Nabokov, A. Pilipov, V. Galeyev, V. Volkov, S. Marusyak, and F. Fayzulin are serving as commanders and political workers.

Of course not everything is as we wish it to be. The mechanism of impeding perestroyka has been pretty well shaken, but not totally shattered. Part of the blame for this must be borne by the political section, political agencies, and party organizations of military educational institutions and units, whose influence on the process of positive changes in ideological work does not yet fully meet the demands of the time. That which we have accomplished essentially constitutes initial steps toward creating an effective system of ideological and professional training of command cadres.

The resolutions of the 19th All-Union Party Conference and the decisions of the July (1988) CPSU Central Committee Plenum, which have evoked profound response in the hearts of the Air Forces personnel of the Volga Military District, demand of all of us, in conditions of extensive democratization of all aspects of life and the affairs of society and the Armed Forces, that we seek and find effective ways and methods of strengthening one-man command on a party foundation and further improvement of ideological-theoretical and professional training of leader personnel at Air Forces schools and in Air Forces units.

Squadron Political Officer Seeks to Encourage Competitiveness

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[Article, published under the heading "Socialist Competition: An Accelerative Factor," by Capt A. Soshnikov: "Lever and Fulcrum"]

[Text] Maj A. Frolov stopped in front of the faded socialist competition display board and, gazing at it sadly, said to himself: "Who are we trying to fool? Ourselves...."

He had long been troubled by problems connected with increasing the effectiveness of Air Forces personnel socialist competition. Even before being made deputy commander for political affairs of a helicopter squadron, when he was serving as party buro secretary, he had said repeatedly that competition in which publicity and comparability of results boil down to lip-service filling in of

squares on a display and possibilities of passing on advanced know-how boil down to putting out news bulletin leaflets full of general phrases is not worth a damn.

The major, a pilot with a goodly number of years under his belt and three times decorated, had learned through his own experience that ultimately lip-service competition evokes an inverse reaction in people. In place of a spirit of competition and a striving toward the heights of professional expertise, irritation builds up, and skepticism and apathy appear. The fact is that during the years of stagnation everybody became sick and tired of noisy slogans and appeals which were not backed up organizationally.

Upon reporting for duty in his new position of squadron deputy commander for political affairs, Aleksandr Nikolayevich first of all studied the state of affairs in the subunit. Frankly speaking, things were not so good. Combat training results were fair to middling. And even these results had been achieved for the most part thanks to the skill of a small number of veteran pilots who had taken on the most difficult task assignments. The party organization was functioning sluggishly. Many officers lived according to the principle of "well, I made it through another day." The deeper the political worker looked into the squadron's problems, the more it became clear to him that he alone, even if he were a genius, would be unable to cope with the inertia and indifference. But there was no time to waste. Drastic steps were urgently needed.

One evening the deputy commander for political affairs asked party buro secretary Capt I. Mukmenov, a man of boldness and strong principles but a man who, it seemed to Frolov, was not receiving sufficient practical support from party members, to stay a bit after work. Frolov felt that the most probable reason for the lack of support was the fact that the secretary carried the entire burden of party work.

That evening they talked about a great many things. In spite of some difference in their views, they reached the conclusion that it was necessary to declare war on downward leveling in assessing the contribution of each individual to the end result of the squadron's labor, increasing the men's faith in the fairness of performance evaluation. It was also necessary to combat excessive attention to form in community affairs with consequent detriment to content. And socialist competition was supposed to help in these efforts.

"I have the feeling that things are going to get pretty hot for the squadron command element at an expanded meeting of the party buro," said Mukmenov. "If we get people going, you just watch them give it to those guys."

"No problem; criticism from below sets superiors straight. And we also have no other option," replied Frolov.

He was expecting help not only from the party buro but also from the squadron commander, Lt Col Yu. Tarasov. He knew him to be a demanding Communist of principles and integrity. He was concerned only about one thing: that at the party buro meeting the squadron commander might go too far and start dictating who was to do what and how. Centralized distribution of roles in community affairs is a thing of the past. Today each individual should determine his own role. Then he will feel greater responsiblity for accomplishing his task.

At first things did not go too well at the meeting.

Comments came from the floor: "Who cares what we think? If it is a matter of punishing somebody, that is another thing altogether! In these matters the party buro is like a watchdog of law and order that is invoked to inspire obedience. But when decisions are made they forget about us...."

Frolov had known for years many of those attending the meeting. He had gone through plenty with some of them, performing their internationalist duty in the Republic of Afghanistan. These were men of action, who could not tolerate empty talk. Perhaps this was why they were in no hurry to speak up: it seemed a futile exercise.

The people seemed to show a bit more interest only when the squadron commander took the floor. Lieutenant Colonel Tarasov, although his feelings had been hurt by the first speakers' critical comments to the effect that he did not rely much on the party acivists in his activities, frankly acknowledged his personal deficiencies and shortcomings. He pledged to correct them, but he stressed that he would also be doubly demanding on others.

"Well, comrade Communists, let us henceforth think out everything together, so that all matters will already have been discussed in the collective by the time I make a decision as commanding officer. Agreed?" the squadron commander ended his remarks.

The classroom resounded with an approving ripple of voices. There had clearly been aroused lively interest in the subject brought up for discussion. People headed for the speaker's stand one after the other....

The party buro made the following decision regarding organization of socialist competition. At the beginning of a flight operations shift each aviator, weighing his capabilities, would target in advance the performance mark which he would seek to earn. Right on the spot they determined who should compete with whom.

That is how things were conceived. But here is how things actually worked out.

Pilot Sr Lt V. Dotsenko was to take a performance-graded check ride involving aircraft handling and maneuvers in the practice area. On the evening preceding the flight Frolov saw the young officer standing in front of the socialist competition display. He walked over toward the display. Opposite his name Dotsenko had entered the number 5 with a firm hand.

"Are you sure you can handle it?" the political worker asked.

"No doubt whatsoever!" the pilot confidently replied.

...Analysis of the flight data recorder tapes indicated that the pilot had performed barely up to the performance level rating of 4. Apparently he had been done in by his self-assurance, causing him to make mistakes in his flying technique. Dotsenko was upset when he found out what mark he received. He was embarrassed to face his flight commander, who had expended so much time and energy on his training, and he was even more embarrassed to face the deputy commander for political affairs, who had witnessed his puerile bragging.

Waiting for the proper moment, Frolov called Dotsenko aside: "Why are you trying to avoid me?"

"Forgive me, Aleksandr Nikolayevich. My behavior left something to be desired."

"Okay, let's forget about it. I think you will end up earning that 5. But don't overestimate your ability. Only movie heroes are made attractive by bravado. What we need is inner reliability."

The senior lieutenant nodded in agreement and hurried off to the control tower building. Gazing after him, Frolov said to himself: "What we need is fewer pretty speeches and more individual work with the men."

Somewhat later Aleksandr Nikolayevich analyzed the available data and reconfirmed his conviction that there had been many errors of omission in the moral-psychological training of aviation personnel. The flight commanders were more concerned with the technical aspect of things: they conducted special tactical drills, practice sessions on the training simulator, etc. But the men's hearts and souls remained beyond the extent of their attention and concerns. And yet practical realities indicate that every young officer goes through a so-called "period of bad luck." As a rule it concides with that period when, after being approved to fly solo, after 10 or 20 solo training sorties, a pilot begins to think that he understands everything, knows everything, and has the ability to do everything. This is where problems begin. Self-assurance leads to lack of concentration, which in turn leads to mistakes in the air. The Dotsenko case is confirmation of this.

Aleksandr Nikolayevich decided to conduct an experiment: to transform individual indoctrination work via competition, which began to pick up appreciably.

During a certain flight operations shift Sr Lt Capt I. Pomazanov and flight commander Capt Sh. Sagdatullin were to fly identical training sorties—weapons delivery against ground targets.

"How would you like to compete with Sagdatullin?" Frolov asked Pomazanov.

"Are you kidding?" the officer replied in embarrassment. "Compete with him?"

"Why don't you try it?" the political worker insisted. "Or do you lack professional pride?"

"Not on your life!" retorted Pomazanov.

The suggestion to compete with Pomazanov did not faze Sagdatullin. You could sense that he was confident of his ability.

...Aleksandr Nikolayevich waited impatiently for the pilots to return from the air-to-ground range. When the aircraft landed, he learned that Captain Pomazanov had performed the mission better than the flight commander.

"Well, Shamil, did he get you?" the deputy commander for political affairs asked, his eyes narrowing.

Sagdatullin was about to lose his temper, but he immediately regained his composure: "No problem; we'll analyze mission performance and draw the necessary conclusions...."

Performance on the next training sortie was also extremely good. Both officers received a mark of excellent. It is true that the squadron commander gave Sagdatullin higher marks on quality of execution: there had not been the slightest flaw in his performance.

The deputy commander's experiment was successful: he had gotten one pilot moving, raising his fighting spirit, and he had forced the other to work harder and not to rest on his laurels. The political worker also became convinced that a spirit of competitiveness is inherent in everybody—only a stimulus is needed to bring it out. The situation experienced by this veteran pilot, who was beaten by his fellow pilot, on the one hand hurt Sagdatullin's pride, while on the other hand it forced him to take a more sober view in evaluating his level of skill. And this is very important! A sense of realism is of primary importance for a pilot, since it is a component part of flight safety. Captain Pomazanov needs no commentary. His success inspired him. And do you think that henceforth he would allow himself to do a worse job?

Once Frolov himself got into an interesting situation. He was to fly as copilot-navigator on a performance-evaluated training sortie with Sr Lt P. Voykin as aircraft commander.

"Sahll we try for a five?" the political worker asked Voykin prior to takeoff.

The latter, thinking for a moment, replied: "How about a four?"

"Come on. I'll keep us on mission schedule to the second. I also guarantee to maintain precise track."

Voykin continued to insist on aiming for a four.

"Okay, if you say so," replied Aleksandr Nikolayevich, not entirely understanding his stubbornness.

...Having analyzed the quality of performance of the mock combat mission, the squadron commander summarized: "A mark of excellent for Voykin's crew."

After flight operations were completed, the deputy commander for political affairs went up to the senior lieutenant and asked him right out: "Are you playing it too safe?"

"What are you talking about, Aleksandr Nikolayevich?" Voykin replied. Then, with a sly smile, he continued: "Judge for yourself. Could I have placed the commissar's reputation in jeopardy? And what if we had not gotten a mark of excellent?"

"He's got me there," Frolov said to himself. He had a lot to think about that day. He was seeking an answer to a question which had long bothered him: why is it that experienced pilots are not anxious to take a leader position? He was unable to come up with a persuasive answer to this question.

He was helped by a chance occurrence. He once heard an officer from the neighboring subunit make the following statement: "What's the point of this competition? Whether you are a leader or a lagger, your pay and chances of advancement are the same. I have been flying copilot for years! It doesn't matter whether I am a vanguard performer and receive marks of excellent; they are not promoting me. There is one explanation for this: there is no slot available. A couple more years of this and that's it for my career—I will be considered to be without promise. That's the way things go: you are young, young, and then suddenly you are old!"

These words made the political worker feel depressed. It is true that he did not agree on all points: the fact is that we do not serve solely for those stars on our shoulder boards. But commendations and certificates of achievement cannot perpetually serve as the main incentive. But one can hardly accuse the pilot and those who shared his opinion of a lack of selflessness and decency. Every one of them has served in Afghanistan. They all have combat decorations. They have stared death in the face more than once while carrying out their internationalist duty.

And the fact is that he has not received a promotion in years. And this has caused resentment. Many of those with whom he began his military service have moved up the ladder of promotion, while he is there just marking time. Why is this happening? Where is fairness and justice? But Frolov was not accustomed to putting the blame on higher-ups. "I've got to look for a solution to the problem right here," he decided.

He shared his thoughts with the squadron commander. Lieutenant Colonel Tarasov treated him with understanding and seriousness. He too had long been troubled by a question: why does combat training sometimes seem to drag along? Analyzing socialist competition results, the leader-Communists determined a number of individuals worthy of promotion to a higher position. There was a single criterion: attitude toward one's job.

Time has passed. There are now three copilots in the squadron who are fully prepared to assume the duties of aircraft commander. Several other officers are mastering the job duties of the next higher position. The chance of promotion has gotten people moving and more active. This gratifies Frolov, but it also concerns him: will they all be able to move up the career ladder? After all, a great deal is not dependent on him or the squadron commander. The political worker is worried that bureaucratic and situational obstacles will prevent them from achieving full fairness.

Of course one must be a realist. Not all lieutenants are fated to become generals. That is a fact of life. The career pyramid, just as any other, becomes narrower toward the top.... But there is also no doubt that the most capable people should move upward. If social justice is violated. there is no guarantee that some officer will not ask himself why he should continue as a performance leader when all he gets is promises. Then a wave of skepticism, the destructive force of which is well known, will sweep through the subunit....

Aleksandr Nikolayevich's concern is not groundless. Socialist competition is a powerful lever for raising a subunit's combat readiness, but in order for the lever to work, it needs a solid fulcrum. The function of fulcrum can be performed by well-conceived labor incentive for outstanding performers. The present verbal incentives are not very powerful. Such a fulcrum will not stand up under a heavy load but will collapse. The political worker is wracking his brains over how to strengthen it.

Highly-Decorated Helicopter Pilot Praised

91441096d Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 10, Oct 88 (signed to press 6 Sep 88) p 9

[Article, published under the heading "Officer's Honor," by Lt Col V. Bezborodov: ""Yessir, Going to the Rescue!""]

[Text] It happened quite some time ago, during his first Afghanistan tour, but I remember it as if it were just yesterday.

...Can one land a helicopter when it cannot be done? But it is also out of the question not to land, because there is nobody else to bring food supplies to a starving Afghan village. By the time the flood-swollen river recedes, by the time the combat engineers rebuild the bridge which was carried away by the high water, and by the time the disaster area can be reached by ground, it may be too late.

Make up your mind, Captain Oleynik! You are authorized to act as the situation dictates. If you return, nobody will blame you. Squadron commander Maj Nikolay Ovchinnik, flying lead, will be able to "thread the needle" between the mountains, for he is an ace. But you are only almost an ace, and this "almost" is that tiny weight on the scales of life and death which can cause the scale to tip.

Make up your mind, helicopter pilot! But bear in mind that you are risking not only your own life. If you don't make it, you won't save from starvation the people waiting on the ground below, and you'll put yourself and your crew into the ground permanently. Have you made up your mind? Then get moving! Copilot Capt Sergey Kazakov, navigator Sr Lt Valeriy Voloshin, flight technician [crew chief] Sr Lt Sergey Gorlov, and gunner-radio operator WO Igor Senko are working calmly at their stations. They have faith in you, and you in them. Everything is fine, skipper!

I wonder who first called a helicopter a dragonfly. Probably that is what they christened the Mi-1. Back at flight school they called the nimble little helicopter a dragonfly. They do not apply this name to the Mi-4, which he had also flown. The word certainly does not apply to the Mi-6, which is much larger and has quite different handling characteristics. You get this baby up to speed, and it is not so easy to avoid obstacles. And there were a lot of obstacles here, all of them equally menacing.

His hand, obeying the decision which had been made some time ago, lightly touched the control stick as if of its own volition, and the heavy helicopter, following the leader, hugging the cliffs, flew in a wide, broken arc, following the bends of the river and the steep mountainslopes. Suddenly he spotted a site which just might be marginally suitable. Go for it, skipper; you can't make a go-around here. They were heavily loaded today and would have to land airplane-style, but the landing area was rather small, and also sloped toward the river.

The squadron commander landed and taxied to clear the landing area. They had practiced similar, although not identical maneuvers time and again. Do as you were taught: a steep but smooth turn.... Now—down!

The rotor blades kicked up clouds of dust. For millions of years the sun and wind had weathered away the rocks into powder, and now it was rising into the air and making it hard to figure his touchdown. Take it easy, skipper, hold your nerves in check, hold it steady until you touch down. Once you are down you can go over it again in your mind, give a shiver, and close your tired eyes for a minute, but for the moment—four meters, three, two, one.... Touchdown! Now apply the brakes.

The helicopter pilots simply had to land. They performed to the limit of their ability. You won't die of starvation after all, young fellow! You too, old man!

There were many such difficult runs! Day and night, in all weather Capt Sergey Oleynik's crew flew wherever their help was needed. This tall, solidly-built pilot and his crew were known in the most remote villages.

Later they returned home. Combat training, fighting floods and fires.... He came to Afghanistan on a second tour of duty, this time as a detachment commander. He had more experience, but he also bore greater responsibility.

Once again he hauled supplies, spent hundreds of hours in the air, frequently making landings into austere, unmarked sites. The detachment transported assault troopers, weapons, fuel, and ammunition. But his most important, truly strategic cargo was bread, a gift to the Afghans from the Soviet people. No wonder the dushman [Afghan rebels] fought so savagely to impede the delivery of this cargo. Sergey, who had been born and raised in the village of Malinovka in Tselinograd Oblast, knew the value of bread from childhood. How could people firing at bread call themselves defenders of the people? But the dushman were firing, knowing that they were killing their fellow countrymen with starvation. On many occasions heavy-machinegun tracers and projectiles fired by mountain-version antiaircraft guns whistled past the helicopters. But the aircrews' skill helped avert disaster. The detachment sustained no casualties.

In his free moments Sergey would frequently pull out photographs of his wife and children and reread letters from them. He realized how much they missed him back home. His boys, Ruslan and Vitalik, beamed carefree smiles in the photograph; they were still too young to understand, but there was concern in his wife's eyes. Zina understood the meaning of war. She alone knew the

price of each day they were apart. But there are also children in Afghanistan. Can one protect one's own children and not save the children of others?

...The men followed their commander without hesitation, gaining skill from one mission to the next. And navigator Capt Anatoliy Muzhikov, flight technician Capt Vladimir Nikolayev, flight mechanic WO Viktor Gnitko, gunner-radio operator WO Vladimir Kirichenko and others of Oleynik's fighting comrades had plenty of courage. Many of them have been decorated for successful missions. Maj S. Oleynik has been awarded the Order of the Red Star and the Order for Service to the Homeland in the USSR Armed Forces, 3rd Class.

Soldier-internationalists, who have seen so much suffering on Afghan soil, keenly feel another's pain and are always ready and willing to protect the lives of others. This is why they were the first to step forward when they heard about the disaster at Chernobyl.

Once again they flew what amounted to combat missions. Once again they grappled with death. From the very first days Gds Maj Sergey Oleynik, with Gds Majs Aleksandr Ryzhov and Vitaliy Yevdokimov, Gds Capt Aleksandr Oskolkov, Gds Sr WO Viktor Grigoryev and other guards helicopter crewmen, flew missions to determine the radiation situation, dumped tons of payload into the maw of the reactor, and conducted radiological decontamination.

If they ever build on the banks of the Pripet a monument to the heroes who fought the disaster at the Chernobyl Nuclear Power Plant, one of the first lines on the memorial obelisk will be dedicated to military helicopter crews. Many of them were decorated. Gds Maj S. Oleynik was awarded the Order of the Red Star.

Time and ordeals have added to his experience and skill, but they have not diminished his readiness and willingness to come to people's assistance or his love for his difficult but so necessary profession. We read in the efficiency report on squadron deputy commander Gds Maj Sergey Ivanovich Oleynik, just as many years ago in the efficiency report on pilot cadet Sergey Oleynik: "He is enthusiastic about flying and loves to fly."

Soviet-Afghan Manned Orbital Mission Described

91441096e Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 10, Oct 88 (signed to press 6 Sep 88) pp 10-11

[Article by V. Lyndin: "Fourteenth International...."]

[Text] On 29 August, at 0823 hours Moscow time, a Soviet spacecraft was launched at the Baykonur space launch facility, carrying an Afghan national in addition to Soviet cosmonauts.

The Soviet Union has time and again assisted its neighbor to the south. Let us recall the first Soviet-Afghan Treaty of Friendship, signed in 1921. It was that treaty which opened up for the Afghans a road to the heavens. At that time the first Afghan flight school was established in Kabul with the assistance of Soviet specialists. Our country donated several aircraft to that school. While the school was in the process of getting on its feet, young Afghans learned rudimentary flying skills at Tashkent. Since that time, such assistance has become traditional. Many Afghan pilots graduated from service schools and subsequently from service academies in the Soviet Union. They include the first Afghan cosmonaut, Abdul Akhad Momand, and his backup, Muhammed Dauran Gulyam Masum.

Selection of cosmonaut candidates was handled according to a multistage arrangement, adopted virtually for all missions with international crews. A total of 457 persons were vying to take part in the Soviet-Afghan manned mission.

"Our medical examining board," explained Lt Gen Avn V. Shatalov, commanding officer of the Cosmonaut Training Center imeni Yu. A. Gagarin, "considered those candidates submitted by the Afghans. At first there were more than 50 candidates. Additional medical examination reduced that number to 19, then to eight, and finally to two."

The Soviet-Afghan crews were led by twice Hero of the Soviet Union Col V. Lyakhov and Hero of the Soviet Union Col A. Berezovoy. These pilot-cosmonauts USSR are well known. They have added glorious pages to the history of Soviet space exploration. But the other crew members and their backups are little known to the readers.

Valeriy Vladimirovich Polyakov and his backup, German Semenovich Arzamazov, are graduates of the 1st Moscow Medical Institute imeni I. Sechenov. Both are candidates of medical sciences and work at the Institute of Medical and Biological Problems of the USSR Ministry of Health (IMBP).

Polyakov was born in Tula in 1942. Upon completing school he went to Moscow and enrolled at a medical institute in the faculty of therapeutics. After completing medical school he was employed as a clinical staff physician at the Institute of Medical Parasitology and Tropical Medicine imeni Ye. I. Martsinovskiy; he later worked at the Institute of Social Hygiene and Organization of Health Services imeni N. A. Semashko, and at the USSR Ministry of Health. He has worked at IMBP since 1971.

Valeriy Polyakov has been a member of the Cosmonaut Corps since 1972, but he began special training in a cosmonaut candidate group in 1969. For the future physician-cosmonaut this training included various

areas of space studies specialization and advanced training in providing emergency medical care in conditions of space. Has he put his knowledge to practical use?

"Yes," replies Valeriy Vladimirovich. "I have done everything, including CPR.... But that did not involve cosmonauts. Cosmonauts have to date not required such procedures."

Polyakov took part on numerous occasions in providing medical support for spacecraft and space station crews. He has worked with the Mission Control Main Operations Group and with the Search and Rescue Service. He took part in survivability experiments in various climatic zones. He has made 12 parachute jumps.

In 1978-1979 he completed the course of study on principles of spacecraft control and was assigned as a research physician to the team handling preparations for flights to the orbital station. On two occasions he sat on the "substitutes bench"—he was a backup for the Soyuz T-3 crew in 1980 and for the Soyuz T-10 crew in 1984.

Physician-cosmonauts have practical acquaintance with weightlessness or, more precisely, with the effects of weightlessness on the human body. An experiment was recently conducted at IMBP in which volunteers remained in bed for an entire year. They experienced almost the same changes as cosmonauts under the effect of weightlessness. Polyakov and Arzamazov directly participated in this experiment.

German Semenovich Arzamazov is 4 years younger than his colleague. He was born in the village of Shubino, Sharanskiy Rayon, Gorkiy Oblast. After secondary school he went through Sanchursk Medical Training School and became a doctor's assistant. After serving in the military, he enrolled in college. In 1974 Arzamazov was assigned to IMBP (his specialty—surgery).

German Semenovich is a parachuting enthusiast. He has made 106 jumps of varying difficulty. In 1976 he began special training as member of a cosmonaut candidate group, and in 1978 he was accepted into the Cosmonaut Corps.

Abdul Akhad Momand was born in 1959 in the community of Sarda, Shilgar district, Ghazni province, to a Pathan peasant family. Upon completing secondary school he enrolled at Kabul Polytechnic Institute. In 1978 he was inducted into the army and sent to the Soviet Union to study at a military school for pilots.

Muhammed Dauran is five years older. He was born in Nijrab district of Kapisa province. He attended a military secondary school (something like our Suvorov school) and studied at a military flight school in Afghanistan. He was subsequently sent for training to the Soviet Union. Here he mastered the MiG-21 fighter and subsequently flew that aircraft exclusively. And he flew a great deal, in difficult conditions of military operations. Dauran's contribution to defense of the April Revolution has been rewarded by combat decorations, and he won an early promotion to lieutenant colonel, and subsequently to colonel.

Abdul Akhad and Muhammed became acquainted after the second selection board. Their paths had not crossed prior to that time. They had received training at different times, and they flew different aircraft. After the academy Dauran was first made a deputy commander and later a regimental commander, while Momand was made a regimental deputy commander for flight training.

The fact that the cosmonaut candidates know Russian well, obtained higher education in the USSR and have experience in working with Soviet equipment made it possible substantially to shorten their training, and the mission, which was initially scheduled for the first half of 1989, became reality at the end of this summer. Both possessed skills in working together with Soviet specialist personnel—they had repeatedly taken part in combat missions, coordinating the actions of their subunits with Soviet pilots.

On 24 February 1988 Abdul Akhad Momand and Muhammed Dauran began general cosmonaut training at the Cosmonaut Training Center imeni Yu. A. Gagarin, and on 25 May they commenced training as crew members on the specific mission program.

The general outline of the scientific program for the Soviet-Afghan mission was determined at the initial meeting between representatives of the two countries on 30 September 1987 in Moscow, at USSR Glavkosmos. Final agreement on the list of experiments was reached at one of several subsequent meetings, on 11 February 1988. Two areas were given focal designation at the request of Afghan specialists: investigation of natural resources by remote sensing, and medical experiments.

All countries are today interested in studying natural resources. Therefore the work schedule of every international crew which has flown aboard Soviet spacecraft and space stations has placed considerable emphasis on satellite imagery and visual-instrumental observation of the territory of the participating country. Such experiments have long since become a permanent component part of the work performed by Soviet cosmonauts in Earth orbit.

The bulk of information is to be obtained with a KATE-140 fixed topographic camera mounted on the base module of the space station complex. This camera produces panchromatic black-and-white photographs. From an altitude of 350 kilometers, each frame covers an area on the Earth's surface measuring 450 x 450 kilometers, with ground resolution of 50 meters.

To obtain additional data on ground objects, natural features and other phenomena on the territory of Afghanistan, the cosmonauts performed visual-instrumental observations, using handheld cameras and binoculars.

Afghan specialists will be given scientific methods assistance by Soviet colleagues in thematic processing of experiment materials. The results of the investigations of Afghanistan's natural resources are to be used primarily for performing practical tasks.

"All elements of the periodic table can be found in Afghanistan," says Abdul Akhad Momand. "But mineral resource extraction involves primarily natural gas, coal, and salt."

Geologists are hoping that satellite imagery will enable them to spot new and refine known systems of linear faults in the Earth's crust, ring and dome structures. A comparison of their location with data on distribution of mineral deposits will make it possible to determine previously unknown zones which show promise for oil, gas, and mineral ore exploration. Of considerable interest is study of snow and ice cover in high-mountain areas, and the water resources and hydropower potential of the rivers, for more than 90

of electric power produced in Afghanistan is generated by hydroelectric power stations. Potentially dangerous seismic, avalanche, and mudflow areas are also targets of observational study by the Soviet-Afghan crew.

Study of soil conditions, land reclamation and improvement, vegetation, and agricultural land (agriculture comprises the foundation of Afghanistan's economy) is only a partial list of the tasks to be performed by Afghan specialists with the aid of information obtained from orbit.

The program of medical experiments drawn up by Soviet and Afghan specialists for the joint mission has been made a component part of a future program of scientific research conducted aboard space stations by Soviet and international crews. It includes experiments which were conducted during the Soviet-Afghan crew's stay aboard the Mir space station as well as medical examination of the cosmonauts before and after the mission.

In view of the special significance currently being attached to the working efficiency of a human operator functioning in a "man-machine-environment" system, comprehensive investigation of a cosmonaut's work efficiency in the initial phases of adaptation to conditions of space flight became a principal directional focus of the medical program for the Soviet-Afghan mission, including study of operator activity, physiological and psychological reactions of the system, and the state of analysor systems.

Medical research conducted aboard the Mir space station involved equipment built in the People's Republic of Bulgaria according to preliminary specifications agreed upon with Soviet specialists. This equipment was delivered into orbit by the Progress 36 robot cargo vehicle and performed beautifully during the Soviet-Bulgarian mission. One feature of current research activities is the fact that a medical doctor, a member of the Soviet-Afghan crew, is taking direct part in these activities.

The Bulgarian Zora microprocessor system is simplifying things for the cosmonauts, providing display of instructions and performing automatic collection and analysis of materials in the process of conduct of experiments. Obtained information is stored in the computer and transmitted to Earth by data link or is returned in the form of diskette files.

The Soviet-Afghan crew conducted Statokinetika experiments (study of changes in coordination and control of movements in weightlessness) with the aid of the Zora system, plus other experiments: Potentsial (investigation of the parameters of muscle potentials); Labirint (determination of the mechanisms of development of motion sickness and the search for ways to prevent it); and Opros (investigation of individual features of cosmonaut psychological adaptation to conditions of flight).

The Prognoz experiment, the purpose of which is evaluation of the dynamics of mental work efficiency and sensory coordination, was performed with Pleven-87 equipment. Obtained information was fed into the Zora system.

Effectiveness of a cosmonaut's work activities is determined in large measure by adequate sleep and rest. The Son-K experiment provided for obtaining this data by recording electrophysiological indices and with a special questionnaire.

Space and Afghanistan. Even quite recently these words seemed so distant from one another. Prior to the 1978 April Revolution Afghanistan was one of the world's five most backward countries. Even today there are plenty of problems. The flames of the fratricidal war kindled by foreign instigators have not yet been extinguished. But one must also think about peaceful future life. An all-seeing gaze from space can render specific assistance in solving the country's economic problems.

Vignettes of Combat in Afghanistan

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[Article, published under the heading "We Are Internationalists," by Lt Col G. Drugoveyko: "34th Parallel and South..."; concluding part of two-part article (see No 9, 1988)]

[Text] **Combat Missions**

No, I was not mistaken. Both the first time and now everything is repeated. The commanding officer utters normal peaceable, even charitable words.

Hauling personnel, passengers, and cargo. Communications relay flights. Providing air cover for passenger and cargo aircraft departures and arrivals. Delivery of mail. Evacuation of wounded. Outpost resupply. Aid to the civilian populace.

Only one item has a combat sound to it: immediately destroy rebel weapons if they deliver fire.

A much more ominous vocabulary reflected the situation in which the Republic of Afghanistan would be living during the next 24 hours. The rebels were guiding the country's history as they wished it.

Disruption of traffic on main highways. Acts of terrorism and subversion. Intensive stockpiling of all kinds of weapons throughout the country. Setting up new combat positions. Redeployment of air defense assets.

The commanding officer's operation order presented a complete picture of this strange war.

Dense deployment of modern air defense weapons is somewhat reminiscent of landmine warfare. The skies were "mined" with Stingers and heavy machineguns. But the adversary was not engaged in antiaircraft defense of his forces. Here the most modern weapons were in the hands of "freebooters."

They do not fight according to the laws of military necessity and expediency, even hostile expediency. No, they fire just in order to shoot down. To shoot down as many as possible. WHERE is of no significance, and WHO is not important. They seek to shoot down and receive reward. They seek to shoot down, without being troubled by the question: I wonder who was on board?

Hence the specific features of air combat operations and the psychological countenance of the "Afghan" aviators. They do not fight too many actual engagements, but they are constantly under extreme stress and tension. They must be constantly prepared and ready for any unexpected surprise, from takeoff to landing, throughout their entire in-country tour of duty. Until their return to native soil and the skies of the homeland.

This psychological burden leaves a deep mark in a person's soul. It forms and shapes the deeper recesses of one's personality, a complex, conflictive and contradictory inner world, laid bare, and for that reason wounded by the slightest injustice.

A person returns home. Great is his joy from duty performed honestly and worthily. Confidence in his own combat strength. Life experience on intimate terms with the naked truth of combat. And pain, the persisting pain of loss. And a great deal else as well. A person returning from war holds a great deal.

Forward Air Controller

I like to read over old letters, especially one particular letter—from former forward air controller Capt Sergey Sorokin. This letter contains some kind of unseen strength. It always helps make me feel better. It helps. This letter is essentially from an officer with whom I am not acquainted. There is a certain page in the letter....

"...I wanted literally to force my body into this rocky, alien ground. Hostile fire is becoming increasingly more dangerous. It is quite clear that if I cannot make it to the vineyards, I'm in trouble. I looked around. The air assault troopers were delivering fire. Two were hovering by their commanding officer, who had apparently taken a round.

"I realized that within a few minutes the dushman [Afghan rebels] would approach quite close to us, behind the cover of boulders. And the battle would become a slaughter. But how could I pull away from the ground, stand up and take that first step?

"I caught the eye of one of the sergeants. I explained to him by sign language what I intended to do. I then issued a command to all the troopers: 'Let's pull back to the vineyard. Two men assist each wounded. Get ready!'

"A few seconds later I motioned to the sergeant—move out!

"Finally we reached the vineyard. I had a strange sensation. The enemy's fire had not slackened off a bit; bullets were whistling past quite close, snapping twigs and vines. But the grape leaves seemed like armor. And I was no longer as afraid. Now it was a fair fight. The dushman were behind the rocks, and we were sheltered by grapevines...."

All our soldiers in Afghanistan are proud of and have affection for the forward air controllers. Such affection must be earned.

Even before I met Sr Lt Vladimir Koval I knew that during his tour of duty in Afghanistan he had logged 20 field operations with air assault troops, that the missions had been quite varied, and that none of them had been easy. I knew that the battalion commanders vie with one another for the right to take this officer along on their next foray.

I gazed at the FAC's suntanned, windburned face and for some reason had this feeling that he probably looked like his mother. Manly features, but a very kind expression. He had a slightly hoarse, but soft and also kind voice.

...They were sent out on a mission. It had been learned that the rebels were planning to perpetrate an exceptionally cunning, inhumane, and vile terrorist act. They were planning to lob chemical-warhead rocket projectiles into several villages, and from the direction of Soviet lines.

Vladimir Koval was assigned as FAC to one of the detachments with the mission of thwarting this barbaric scheme.

The officer remembered a great deal from this field operation. He remembered the almost stuntman feat of coaxing the fighting vehicles along mountain trails. He remembered the blown-up bridges. And he remembered skirmishes with bandit elements, when the main thing was to avoid being drawn into battle. They would lose the trail and once again proceed to search for and chase after the sole quarry they were seeking in this raid. Other encountered forces during this mission were not to be treated as an enemy to be defeated but rather an annoying hindrance. He remembered a great deal or, more precisely, he remembered everything.

Perhaps this is why he remembers most clearly of all the words spoken by the general who had seen them off on this unusual operation: "I ask you as I would ask my sons: accomplish the mission. And you yourselves be prepared for a chemical attack."

Why does he recall precisely this?

There are different kinds of fame. There is worldwide fame, there is renown within one's profession, and there is reputation within one's garrison, where everybody knows and respects you, where they are concerned for you and wait for you to return from a mission. And when you return, everybody stops you in order to talk.

He experienced the following incident. They had been on the go for three days straight. They had been trudging along trails and scrambling up rocky slopes. They were in pursuit of a particularly bloodthirsty band. They were running out of provisions. They only had a few swallows of water left in their canteens. They were trudging in close single file. Suddenly the soldier in front of him slipped and fell. When Vladimir pulled abreast of him, he heard: "I'm exhausted. I can't go on...." The officer helped the soldier to his feet, wordlessly took some of his gear, and whispered: "You carry the rest, son. I'm also pretty well exhausted."

A few minutes later the soldier asked for the rest of his gear back. He smiled: "And I thought I was finished...."

Just before dawn, just as Vladimir dozed off on his feet and was about to walk off a cliff, a soldier ran up to him and brought him down at the edge of the sheer precipice. This was a different soldier.

Once Koval said: "Up there in the mountains you do not choose the path which is easier but that which is better for combat."

I thought to myself: "But how do we choose our paths? In our everyday lives...."

Forward air controller Vladimir Koval was on his way to headquarters, to be briefed on a new mission. I wanted to say something to him, but I said nothing. I knew that we would meet back in the homeland.

A Quiet Night at Home

When non-aviators talk about aviators, they list a great many different virtues. They talk about courage and valor. They mention with gratitude their willingness to come to one's aid. They talk with amazement about their fearlessness. Air assault troops officer Maj Aleksey Stasyuk, for example, said: "On the ground we can at least take cover behind something. Armor, rocks, or grass. But they are operating right up there in plain view. They fight in the open, and they face hostile fire in the open. We marvel at our military aviators."

...That evening Capt Sergey Blokhin's section was not expecting to be ordered into the air. Things were calm.

The men were writing letters home and engaged in endless conversation about things men talk about. They were reminiscing and dreaming about the future, fortified by robust tea and thick, tasty pancakes just like they get at home. Suddenly they were ordered to report to the command post.

As they entered the command post, the commanding officer was on the phone. They caught fragments of the conversation: "But that is impossible! I understand. Of course, we shall do everything in our power.... Yes.... And we shall also do everything that is not in our power." The commanding officer hung up the phone and turned to the helicopter crewmen. It was obvious to everybody by the way he turned and by the way he looked at them: they would be going out on a mission, and a difficult one.

As they were assembled by their helicopters, the commanding officer said to them: "Nobody but you will be able to judge whether the mission can or cannot be carried out. What I am asking you.... Do not land unless you have fair odds of getting in and out. There is no point in adding your two crews to the wounded. This decision will be the most critical. There you have it, Blokhin."

There was as much danger involved in flying at night in adverse weather, in close proximity to cliffs and rocky slopes, as from rebel fire. They therefore followed the road as they entered the gorge, without any military artifice or stratagem. Of course it was not entirely without plan or calculation. In the first place, the enemy

would not expect helicopters to risk coming to the aid of the motorized riflemen under such conditions. Secondly, the motorized riflemen would do everything they could to draw fire away from the two helicopters. In addition, there would be close air support by a fixed-wing attack aircraft. And the two helicopters were being flown by able crews.

The mission was very difficult, but not hopeless. Combat also involves the art and skill of combat. Tactical planning relies primarily on this factor, as do the hopes of the personnel involved.

"We don't even know what that CAS pilot's name is or who he is, but we'll never forget his help," said Capt Mikhail Sarychev, pilot of the helicopter flying wingman. "He put that battlefield illumination flare precisely on the right spot and precisely at the right time."

"And he gave us a highly accurate and complete report of the battlefield situation. He helped us grasp the situation," confirmed the section commander.

"I only remember his radio callsign—546," said copilot-navigator Leonid Shitin.

The helicopter crews set up the medevac extraction as follows: Captain Blokhin would land and pick up wounded. His wingman would provide air cover and back up the extraction helicopter.

The element leader darted out of the darkness, apparently taking the rebels completely by surprise. As they approached the landing site, only ground fighting was in progress. But upon spotting the helicopter, which was cautiously groping its way down toward the Soviet troop position, the bandits immediately proceeded to criss-cross the sky with tracer rounds. The helicopter was now their main target.

"Even before the section commander approached the landing site we realized that this landing would be like stepping into hell. But now we had a ringside view of the battle area. Dushman were firing from both slopes of the narrow gorge. There were a great many tracer paths, and all converging on a single point," chimed in Aleksandr Vasilyev, crew chief of the second helicopter.

Seven of the wounded were in serious condition. They helped one another. Everybody who had the strength to do so helped. Those who were continuing to fight also helped. The crew chief helped the soldiers get aboard.

"What can I tell you? We were heavily loaded. We had taken 10 wounded on board, and three more were being carried to the helicopter. I asked the pilot: 'What should we do?' The pilot replied: 'Bring them aboard!'" recalled Capt Aleksandr Makhmutkin. "But what I wasn't expecting to see.... There was a nurse ministering to the wounded. Quite a young one."

Captain Sarychev had to forget about the night. He had to see everything and get everywhere. The main thing was to determine what weapon position presented the greatest danger to the men on the ground. The helicopter was poised at the brink and beyond the brink of mortal risk. It attacked the enemy, drawing his attention and diverting destructive fire from others.

A short burst of automatic fire. A steep turn: what other tracer paths were arcing toward the commanding officer's helicopter? Another turn. And again fire met fire. "The attack aircraft pilot was very helpful. He would provide battlefield illumination, and he would tell us where to shoot," recalled Sarychev. "And the troops on the ground did great also. They provided covering fire both for the lead helicopter and us. They did not think only of their own welfare. As soon as tracer paths would start arcing toward our helicopter.... The tracers kept getting closer and closer.... I of course was returning machinegun fire. And I saw heavy, intensive fire coming from the motorized riflemen's positions, directed toward that weapon position which was giving us the most trouble."

I noticed that Captain Blokhin was listening to our conversation just as attentively as I was, and I asked him: "Sergey Georgiyevich, what were you feeling during the fighting?"

The section commander, after thinking for a moment, replied: "What was I thinking? I had a certain function to perform.... There was a job to do, and I was waiting for the loading to be completed. And I was trying to figure out how I was going to get the ship into the air. I was listening to the ground-attack pilot's radio communications, and from his replies I knew that the attention of hundreds of people was focused on us. At the airfield and at the command post. This bolstered our spirits."

Sarychev added: "The section commander also helped our aircrew. He would alert us to new threats."

Blokhin summed it up: "Probably my most important task is to listen to my helicopter: has it taken damage from the dushman? Frankly, this made pretty good sense, as we were under fire for 20 minutes."

Everything finally comes to an end.... Those 20 minutes also passed. Nobody remembered the takeoff. Their attention was riveted on the business at hand.

They landed next to a military hospital. Their quick actions saved seven troopers' lives.

...Back home, in the homeland, it was a quiet night.

New Book on History of Soviet Air Force
91441096g Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 10, Oct 88 (signed to press 6 Sep 88) pp 14-15

[Unattributed book review, published under the heading "New Books": "Air Power of the Homeland"]

[Text] Voyenizdat recently published a book entitled "Vozdushnaya moshch Rodiny" [Air Power of the Homeland] (V. S. Shumikhin, V. M. Pinchuk, V. S. Bruz, et al; L. L. Batekhin, editor, Moscow, Voyenizdat, 1988, 416 pages, 2 rubles 80 kopecks). It deals with the history of establishment and development of the Soviet Air Forces, the multifaceted activities of the Communist Party and Soviet Government aimed at strengthening the Air Forces and providing them with first-class equipment, training of highly-skilled personnel, and maintaining aviation units and combined units at a high degree of combat readiness.

The authors have without question accomplished a very important and necessary task, collecting and classifying a vast amount of documentary materials—from the early years of emergence of a Soviet Air Force up to the present day of Soviet military aviation. This book records the various stages in the great and glorious journey of the Air Forces.

The first section consists of chapters covering the period from 1917 to 1941. This was a time during which the Communist Party and V. I. Lenin personally were taking decisive measures to establish and develop a material and technological foundation for military aviation, to organize a Red Air Force, and to train and indoctrinate aviation personnel.

As of October 1917 Russia's aircraft fleet totaled about 1,500 aircraft, most of which were in need of repairs. Heroic efforts were required of the Bolshevik Party, the worker class, and all working people in order to provide the emerging Red Army with airplanes. On 12(25) January 1918 V. I. Lenin signed the Council of People's Commissars decree entitled "On Confiscation of the Andreyev, Lanskiy and Company Aircraft Plant." All plant property was declared the property of the Russian Republic. Soon aircraft building and aircraft engine enterprises as well as repair and overhaul facilities were taken over by the state. Nationalization of the aircraft industry was the main condition for mobilizing the efforts of this industry for national defense needs.

V. I. Lenin stressed repeatedly that "without science it is impossible to build a modern army...." An outstanding Russian scientist, Nikolay Yegorovich Zhukovskiy, his pupils and colleagues S. Chaplygin, V. Vetchinkin, B. Yuryev, and others became actively involved in development of Soviet aviation.

During those years the magazine VESTNIK VOZDUSHNOGO FLOTA [Air Force Herald] stated: "Do not weaken the battlefront. Make haste toward the motor, the aeroplane, and construction, without waiting for a home-grown Peter the Great or foreign Varangians for our Air Force. Relying firmly on collective unconquerable communist consciousness, come and build airplanes and motors so that the Air Force can spread its mighty wings."

And those wings were indeed spreading. Measures taken by the Communist Party helped provide the Red Army with aircraft. As many as 350 combat aircraft were deployed at any one time at the battlefronts of the Civil War, being actively employed in the struggle against the interventionists and White Guard.

We know how much attention V. I. Lenin devoted to cadres. He stated that cadres are the determining strength of the party and state in building and defending socialism. This question is thoroughly examined in the book under review. The authors trace the process of development of Red Air Force cadres. At the same time, using former Czarist specialists in aviation, the party and government undertook steps to establish aviation courses of study and schools for training workers and peasants into flight personnel, engineers and technicians. In the fall of 1919, at a difficult time for our country, the Moscow Aviation Technical School was formed, to train aviation engineers. Soon the technical school was reorganized into the Red Air Force Engineers Institute imeni Professor N. Ye. Zhukovskiy and transferred over to the war ministry. Thus was born the Air Force Engineering Academy, which became a smithy for the training of aviation cadres.

Bolshevik party organizations played an important role in the establishment and strengthening of military aviation. The authors discussed in detail their activities and the problems with which they were faced. Party organizations did a great deal in the area of imposing requisite discipline, in strengthening organization, and in combating such negative phenomena as reckless derring-do, a fatalistic attitude, and superstition, which characterized a certain segment of flight personnel, especially among the former Czarist-army specialist personnel.

The authors emphasize that aggressive and purposeful party-political work among aviation personnel, improvement in their ideological conditioning, and strengthening of ties with the workers and peasants constituted an important condition for strengthening the combat power of the Red Air Force.

The authors have selected extensive material attesting to the combat employment of aviation during the Civil War years and cite the following figures: aviators flew 21,421 sorties, dropped 94,508 kg of bombs, fought 144 air-to-air engagements, and downed 21 enemy aircraft.

The readers will find a great deal of new and interesting information in the chapters dealing with the upsurge and development of aviation on the basis of new industry. "Fly faster, higher, and further than anybody else!"—this party appeal became a program of action for all Soviet pilots and aviation specialist personnel. At the same time the authors objectively present the difficulties and shortcomings in prewar development of the Air Forces. They truthfully discuss the harm caused by distortions in leadership and the pernicious effect of unwarranted repressive measures, as a result of which gifted aircraft designers, military commanders and political workers, who were devoted to the homeland and the party, suffered. For example, there were four different Air Force chiefs in the three and a half years prior to World War II.

In discussing shortcomings and mistakes, however, the authors reach a fundamental conclusion: the activities of the party and people were exceptionally fruitful and fostered growth and strengthening of the Air Forces and their preparation to repulse imperialist aggression.

A detailed and comprehensive analysis of the development of our military aviation in the prewar years enables readers correctly to understand the events of the Great Patriotic War, with which the book's second section deals. A great deal has been written about this in the past. This book, however, contains considerable new information and interesting historical material, as well as objective current views and assessments. The authors discuss with complete truthfulness the difficult consequences for our military of the treacherous attack by Fascist Germany. But in the most difficult conditions of the initial period of the war, the party Central Committee and Soviet Government drew up and carried out a program for strengthening the Air Forces. An important role in this program was played by achievement of technical superiority over the enemy. The authors cite the following figures: in July-December 1941 the Soviet Union built 8,200 aircraft, while Germany built 8,400; the figures for January-May 1945 were 19,100 and 7,200 respectively. This was accomplished in conditions where by the end of 1941 85 percent of our aircraft industry's production capacity had been dismantled.

Simultaneously with organization of mass production of aircraft, the party Central Committee demanded qualitative improvement of aircraft. Aircraft designers, scientists, and the production people were assigned the following task: to see that our Air Forces possessed better aircraft than Fascist Germany. This task was successfully accomplished thanks to acts of labor heroism by Soviet citizens. The Yak-3, La-7, Il-2, Pe-2, and Tu-2 aircraft became an instrument of our victory.

The war imposed new demands on organizational structure of the Air Forces. The authors demonstrate how flexibly this structure changed during the entire period of military operations. Additional virtues of this book include the fact that it discusses the combat history of all 18 air armies as well as Long-Range Aviation.

The acts of repression in 1937 gravely affected Air Forces cadres. A new wave of unwarranted arrests of prominent military aviation commanders took place in 1941. At the same time during the war years the party Central Committee devoted paramount attention to training, placement and indoctrination of Air Forces command, political, flight, and engineer-technician personnel. The authors discuss this in detail and name gifted commanding generals of air armies, corps and division commanders, and organizers of aviation engineer service and rear services. They include K. Vershinin, A. Golovanov, Ye. Savitskiy, I. Polbin, A. Repin, M. Konstantinov, and others. These people possessed a high degree of political and operational-tactical proficiency and were bold, innovative, and intelligent thinkers.

Skilled party-political work organizers V. Alekseyev, N. Babak, F. Verov, and others worked hand in hand with them. They directed their efforts toward developing in personnel a high degree of moral fiber, total love and dedication to the socialist homeland and hatred toward its enemies, courage, heroism, readiness and willingness to fight the enemy to one's last drop of blood.

The authors reveal fairly fully the major role played in this by specific, purposeful party-political work in the Air Forces. The number of party members in the units grew steadily. By 1945 their numbers had increased by a factor of 3.3 in comparison with the beginning of the war. The finest combat aviators joined party ranks. The authors quote from the memoirs of three-times Hero of the Soviet Union A. Pokryshkin: "I was accepted to membership in the All-Union Communist Party (of Bolsheviks) in the spring of 1942. It was a real thrill when my party credentials were presented to me! Henceforth I would be a Communist, and consequently I must be a person of a special stamp, fearless in battle, maintaining high spirits and, at moments of difficult ordeal, advancing relentlessly toward victory through all dangers and adversities." The overwhelming majority of Communists thought and acted in the same manner.

The authors reach the general conclusion that all these measures by party and government and efforts by the workers and Air Forces personnel ensured Soviet strategic air superiority. During the war years our Air Forces flew approximately 4 million sorties and dropped more than 30 million bombs on the enemy representing a total weight of about 700,000 tons, inflicting enormous casualties and equipment losses. Of the 77,000 enemy aircraft destroyed on the Soviet-German front during the war, pilots were credited with 57,000 kills. Our Air Forces exerted considerable influence on the outcome not only of individual operations but also of the entire war.

The chapters of the third and final section of the book deal with the postwar period of development of Soviet military aviation and the Soviet Air Forces today. These chapters contain a keen assessment of the international situation and of the aggressive aspirations of world imperialism, the United States in particular. The threat of another world war proceeds precisely from the United States. In these conditions the Communist Party and Soviet Government have taken measures to strengthen the security of our country and the countries of the socialist community.

Paramount tasks included the development of jet aircraft and complete upgrading of the Air Forces on the basis of jet aircraft. The question of training flight personnel, engineers and technicians, as well as ideological and organizational strengthening of political agencies and party organizations once again arose. The authors relate in detail how these tasks were accomplished in order to achieve the main objective—maintaining a high level of Air Forces combat readiness.

Thanks to the vast factual material gathered in the book, the readers are able to trace the process of development of jet aircraft of several generations and the bringing of these aircraft onto operational status, to see the difficulties and problems faced by scientists, design engineers, and pilots, and fully to assess their selflessness, wholehearted courage and heroism.

For example, in the 1970's combat aircraft capable of flying at more than twice the speed of sound entered operational status with the Air Forces. Flight altitudes reached several tens of kilometers. The most important feature was the fact that these were aircraft with variable-sweep wings, incorporating an automated control system, integrated bombsight, gunsight, targeting and navigation systems with onboard computer, and carrying guided weapons.

The rapid development of military aviation required increased attention toward political, operational-tactical, and methodological training of officer personnel and their skills. Steadily increasing demands were imposed on the content and methodology of the activities of commanders, political workers, staff officers, and aviation engineer service officers. The authors discuss measures to improve work with officer personnel conducted by commanders and superiors at all echelons, political and personnel agencies.

One can scarcely exaggerate the importance of these efforts. With a feeling of personal responsibility to the party, government, and the entire people, military aviators devote their knowledge to the cause of achieving an all-out increase in the combat readiness of units and subunits, are mastering complex aircraft and weapons, and are reliably defending the achievements of the October Revolution. Soviet aviator-internationalists serving in Afghanistan have selflessly performed their assigned duties, have carried on the traditions of the older generation in a worthy manner, and have built upon the fine traditions of the Air Forces. Their courage and heroism are vividly reflected in this book.

At the same time the authors also reveal negative factors which appeared in the military in the 1970's and beginning of the 1980's. These include falsification and deception, unwarranted promotion of certain officers, a lip-service attitude toward training and indoctrination, loss of vanguard role by a number of party organizations, and a great deal else. The party made a firm, frank assessment of these phenomena. The 27th CPSU Congress and subsequent Central Committee plenums formally articulated a policy of perestroyka. This includes first and foremost enhancement of the role of the human factor, democratization of military life and affairs, and strengthening of party, political influence on all aspects of activities of military personnel. A great deal of work is being done in these areas.

The strategy of acceleration devised by the Communist Party is exerting steadily increasing influence on the Air Forces, which are presently going through a qualitatively new stage in their development. It is a component part of the national, general party restructuring formally articulated at the 19th All-Union CPSU Conference and the July (1988) CPSU Central Committee Plenum and is connected with improving military aviation and increasing its historical responsibility for reliable defense of the homeland. The authors state in conclusion that the requisite moral-psychological potential for accomplisning assigned tasks and resolving urgent problems has been created in the Air Forces.

This group-authored book is intended for a broad readership. People have been waiting for such a book, and it is here.

Improving Training Procedures in Fulcrum Fighter Regiment

91441096h Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 10, Oct 88 (signed to press 6 Sep 88) pp 16-17

[Article, published under the heading "Innovators Seek Better Ways," by Col I. Vokhubov: "Direct Relationship"]

[Text] Every time I hear about the successes of the aviators of this guards regiment, which was one of the first to be equipped with the modern MiG-29 fighter, I recall words of praise recently spoken about these aviators by the commander in chief of the Air Forces—Deputy Minister of Defense USSR Mar Avn A. Yefimov. Analyzing the experience amassed by this unit's innovators, he stressed the importance of improving the tactical proficiency of flight personnel, discussing in

detail the innovative activity of former head of air weapons and tactical training Military Pilot-Expert Marksman Gds Lt Col A. Gunko, who had recently been reassigned and promoted.

During a routine tactical theory class this officer would usually give the pilots several variant situations and instruct them to determine how they were to achieve victory. Discussion of possible air combat tactics would develop into an interesting, gripping debate, in which there were no indifferent participants. Everybody took part in this creative process. But the class involved more than this: the results of the discussion would be incorporated into the flight operations schedule and tested in the air. Then the most effective tactics, optimal modes of combat, and variations of the optimal solutions would be synthesized and be made available to all the pilots.

A similar innovative approach is actively being applied in combat training today as well at this Air Force garrison. The benefit of such training classes is obvious. It helps develop in flight personnel the ability and skills essential for assured actions in a complex, sometimes extreme air environment. For this reason training instructors, using the problems method of learning, make the pilots themselves decide what to do to achieve maximum results in nonstandard air-to-air combat situations. Experienced flight commander Gds Maj I. Kirsanov, for example, in the process of combat maneuvering frequently puts himself in the situation of the pilot under attack. Subsequently, executing a countermaneuver, he endeavors to gain a tactical advantage over his simulated adversary. This method has a favorable effect on the quality of instruction. Finding themselves in similar situations, the younger pilots, following the example of the commander of this vanguard flight, also display the requisite combat aggressiveness.

It is appropriate to note that when pilots study complex missions in this regiment, they do not excessively force the pace or break the methodological sequence, thus preventing the occurrence of hard-to-correct breaks. At the same time the flight and squadron commanders, endeavoring innovatively to simulate combat missions, do not restrict the initiative and independence of the combat pilots. They therefore avoid excessively close supervision, resist the temptation to do everything themselves, and offer their men extensive opportunity for initiative and the incorporation of progressive elements into the training.

Therefore any commander in this regiment, when he makes a combat sortie decision, is always prepared comprehensively and thoroughly to analyze the conditions in which his men will be operating. On this basis he not only correctly and efficiently organizes performance of the assigned mission but also always provides for possible moves by the "adversary" and thinks through his own countermeasures in advance. New approaches in training are most frequently initiated by the present air weapons and tactical training officer, Military Pilot 1st Class Gds Lt Col V. Yashkin, regimental deputy commander Military Pilot 1st Class Gds Lt Col A. Mozgovoy, as well as flight commanders—with a good reputation in the regiment—Military Pilots 1st Class Gds Majs I. Kirsanov and K. Totskiy, veteran pilots Gds Capts A. Lichkun and Ye. Malkovskiy, who are skilled in advanced maneuvers, and others. Their painstaking, innovative efforts are producing good results: the airmen are developing greater purposefulness and responsibility for their professional competence and combat readiness, and an innovative approach to flying is developing. There has been an appreciable increase in follow-through and discipline on the part of all personnel operating and maintaining this modern, fourth-generation aircraft.

Recently a group of innovators in this regiment, led by Gds Lt Col V. Yashkin, classified in detail the most effective air-to-air combat tactics which have developed during training instruction classes and have been confirmed in the air. An innovator suggestion dubbed "plan of battle" was born, developed and formulated in this manner. It received the approval of the regimental command element, party committee and methods council, was acknowledged by the headquarters element and party organization of the parent Red-Banner air division, and essentially represents a specific contribution by the guardsman aviators toward implementation of the decisions of the 19th All-Union CPSU Conference, at which it was stressed in particular that defense organizational development should henceforth be focused primarily on qualitative parameters—both in regard to hardware, military science, and force level and composition of the armed forces.

Proceeding from these demands of the party forum, the guardsmen unfailingly seek to achieve consistently high results in efficiency innovation efforts, the effectiveness of which directly affects quality of training and flight safety. These military aviators are clearly aware that the times urgently demand renewal and restructuring of all efforts pertaining to improving combat training and increasing the combat and operational readiness of aircrews, aircraft maintenance groups, and command and control agencies. And the regiment's innovators are moving boldly in many areas not only of tactical proficiency but of technical innovation as well.

For example, active innovator Regimental Engineer for Aircraft Equipment Gds Maj A. Biin has achieved phenomenal results in adjusting airborne navigation and targeting avionics, reducing the time required to perform this procedure by a factor of more than 20. At the initiative of this same officer, the men decided to redesign the mounting racks in the aircraft equipment classroom and the technical maintenance unit in order to improve the quality of maintenance procedures performed on aircraft equipment. With the assistance of regimental party committee member Gds Maj S. Steriyagov and other leader-Communists, innovators put into use some of the instruments which had not been used heretofore. This has resulted in

increased effectiveness of the training process and improved quality of performance of aircraft inspection and maintenance procedures.

The successes achieved by the guardsmen-aviators during flight training time were due in large measure to the demandingness and concern on the part of the command element and the purposeful activities of the regimental party organization, led by Gds Lt Col B. Vorobyev, delegate to the 19th All-Union CPSU Conference. The party organization is skillfully mobilizing personnel for exemplary performance of the tasks of effective combat employment of the regiment's modern aircraft, further improvement of military skill and professional expertise, improvement of the quality of the training and indoctrination process, and strengthening of military, flight and maintenance process discipline. I should like to discuss in greater detail how the military aviators are working persistently to improve training facilities, which directly affects quality of flight operations and flight safety.

Just prior to the summer period of training, regimental party committee and methods council members made sure that following renovations and repairs, all classrooms contained training displays, models, diagrams, and posters fully in conformity with the demands of the time and the tasks performed by the guardsmen during each specific flight operations shift. Leader-Communists officers V. Basov, V. Romanov, V. Popov and others were clearly aware that without the involvement of efficiency innovators and the large body of party and Komsomol activists it is impossible to make everything required for training aviation personnel. Therefore, before proceeding with improving training facilities, unit headquarters party members discussed this matter at an open party meeting. Both the principal speaker, Military Pilot-Expert Marksman V. Basov, and those who spoke in the subsequent discussion—officers A. Tsyganenko, G. Antipov, V. Popov, and others—leveled strong criticism at those who were still failing adequately to appreciate this important element in improving the quality and effectiveness of training and flight safety. At this point Gds Lt Col V. Romanov and other aviation engineer service officers who had slackened efforts to ensure that training equipment was brought on line in a prompt and timely manner and monitoring of the activities of efficiency innovators were the recipients of a number of critical comments. CPSU member Gds Maj B. Demidenko stated that it was essential that all party members take part in developing and improving training facilities. At the meeting they decided to upgrade the aircraft equipment, avionics, airframe, powerplant and tactics classrooms, to improve working conditions for the efficiency innovators, and to devise and incorporate innovations ensuring safety when working on the equipment.

After this, at the initiative of the party committee, the following lectures were presented for the unit innovators: "The 27th CPSU Congress on Scientific and Technological Advance in the USSR," and "Providing the Air Forces with New Aircraft and Training Systems." Special technical reports were also put out, entitled "Innovators in Search" and "Forum of Advanced Know-How." Assisting the command element, the party committee concentrated considerable attention on extensive explanatory work among personnel and on encouraging creative initiative on the part of aviation personnel, seeking to achieve personal exemplariness on the part of Communists and Komsomol members in efficiency innovation work.

Some time later progress in carrying out the recommendations of the methods council and party decisions was examined at a meeting of the party committee. In implementing the slated measures, leader-Communists stepped up efforts to verify implementation of the training facilities development plan and quality of efficiency innovation work, and devoted greater attention to the technical knowledgeability of personnel. Teams of skilled workmen were formed in each squadron and in the regimental technical maintenance unit to equip individual stations at subunit training facilities. At the initiative of party member Gds Maj V. Grishin, competition was held among subunits for the best layout and arrangement of lecture classrooms, for maintaining them in an exemplary state and condition, and for adoption of the most effective visual aids.

The party committee also did a great deal to increase practical activeness on the part of party members and to develop their technical innovativeness. Today a great many individuals are quite willing to lead technical study groups in the subunits and are taking part in regularly-held efficiency innovator days, aircraft equipment days, and training facilities review-competitions. Visiting the squadrons and the regimental technical maintenance unit, officers V. Romanov, O. Tarasov, and others not only closely observe progress in efficiency innovation activities but also brief efficiency innovation organizers and give them needed practical assistance in a prompt and timely manner. Following the recommendations of the party committee, they regularly present lectures and reports to the men on development of Soviet and foreign aircraft, aircraft armament, and present reviews of new technical developments. Knowledge acquired in this manner helps the men more successfully perform their job duties.

The regimental command element and party committee show concern with improving working conditions for the regiment's handymen, with briefing them on legal and technical matters, with submitted efficiency innovator suggestions, project plans, and particularly those which are the most relevant for achieving effective combat employment of aircraft and aircraft armament and the fate of which must be determined on a priority basis. The party committee directs principal efforts toward increasing the ranks of people of inquiring mind, in order to ensure that the training aids they create generate substantial economic return on effort.

The guardsmen-aviators will be performing more complex and critical tasks in the coming training year. This is a demand of the times and of perestroyka. And as we know, more complex tasks require of military personnel a greater store of knowledge and persisting search for effective forms and methods of mastering job-related skills. For this reason the regimental command element and party organization are devoting unabating attention to innovative efforts by aviation personnel and are doing everything to ensure that these efforts are closely coordinated with current combat and political training tasks. At the recommendation of unit headquarters party members, the methods council recently discussed the question of increasing the activeness of innovators in further improving means of the training and indoctrination process. Council members analyzed in detail the results of personnel technical innovation, revealed shortcomings diminishing the effectiveness of the labor of the regiment's skilled handymen, and specified ways to mobilize their efforts to improve the specialized and technical proficiency of personnel.

The commission on inventions thoroughly prepared specific task assignments for aviation personnel for the new training year. Efforts also focused on improving working conditions for efficiency innovators and providing them with the necessary technical literature. The advanced know-how of officers I. Kirsanov, A. Biin, and other active innovators in this unit was synthesized and publicized.

The training and indoctrination process has been smoothly organized as a result of such purposeful guidance by the command element, party organization, persistence and initiative on the part of all personnel in this guards fighter regiment. Working models, wired training displays, various diagrams and other training aids are the guardsmen's pride and constitute a major help in increasing job-specific knowledge on the part of personnel.

Work to improve training facilities is continuing, however. This subject was recently discussed at an expanded session of the regimental party committee, which commanders, political workers, subunit party organization secretaries, and methods council members were asked to attend. Results of past work were summarized and new tasks were specified for further improving training facilities at the party committee session. And party members are endeavoring to ensure that they successfully accomplish these tasks. They are stepping up their influence on further development of innovative efforts by the regiment's skilled handymen.

In another guards aviation unit officer-innovators V. Podryadchikov and M. Kiut designed a unique data entry console for entering programs into a digital computer. They designed and built this device because, when operating the regular standard equipment, personnel would sometimes make mistakes. For example, in order to insert just one program number it was necessary to manipulate four switches in a specified sequence. With the slightest error it was necessary to repeat the entire procedure.

Following a tactical air exercise, when flight operations had been particularly intensive, innovators came up with the idea of simplifying this process. And they followed through. Adopting a commercially-manufactured panel, they got the manufacturer to change the switching arrangement, installing a single wafer switch for selecting a number in place of four separate switches. This eliminated errors in program insertion.

Their intensive innovative effort produced good results: time to perform the operation was cut by one third. The innovators needed a certain amount of persistence and diligence to get the panel on line. They repeatedly made changes and improvements in the design. Even now, after repeated use of the device in the process of routine flight operations and at tactical air exercises, the officers are continuing to come up with new, unique solutions.

No less interesting is another efficiency innovator proposal—a digital computer malfunction indication display, designed and built by officers V. Podryadchikov and A. Zhuk. This device made it possible to improve quality of servicing and testing equipment in laboratory conditions. The display panel contains indicator lights. A certain number of these indicator lights corresponds to each monitored channel. If signal parameters differ from the specified parameters, a corresonding light on the display panel comes on. It is now no longer necessary to pore through technical manuals and circuit descriptions in order to determine in what channel the malfunction is to be found. Everything is immediately clear.

Another advantage of this innovation lies in the fact that, by using this device, it is easier to train specialist personnel to track down malfunctions and to perform equipment tuning and adjustment.

Organization of efficiency innovator activities occupies an important place in the daily activities of the personnel of both guards units. In view of the increased capabilities of the innovators and the degree of professional competence of each of them, the command element and party organization are scheduling for them not only individual task assignments but also combined projects. This helps improve the process of forming inspection and maintenance procedures and helps accomplish more effective and efficient technical training of aviation personnel.

An endeavor to make a given visual training aid or testing aid more unique and to shorten the time required to master equipment and economize in material resources is today guiding the efforts of the guardsman-aviators in their innovation efforts in pursuit of the main goal: acceleration of intensification of the training and

indoctrination process in the course of perestroyka, increasing vigilance and organization, and further increasing the combat readiness of aircrews, flights, and squadrons.

Caution and Calculated Risk in Combat Decision Making

91441096i Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 10, Oct 88 (signed to press 6 Sep 88) pp 18-19

[Article, published under the heading "Into the Military Airman's Arsenal," by Military Pilot-Expert Marksman Lt Col V. Vazhinskiy: "What Decision Is Better?"]

[Text] What pilot is not familiar with this situation? A "threat" aircraft has been detected, a mock combat engagement will commence within a few seconds, but in the meantime a decision must be made....

Lt Col I. Shakel had led a fighter-bomber strike element toward a target which was to be "taken out." The force leader knew practically every detail of the combat environment. He had studied in great detail on the mission plotting photomap the individual targets comprising the strike objective. Every man on the mission was capable of maintaining his bearings from the primary reference points blindfolded, so to speak; every pilot knew precisely the maneuvers and modes of attack and weapons delivery variations. The air defense system in the objective area had been pinpointed in advance, and a countermeasures plan had been drawn up. All pilots had detailed knowledge of the commander's strike plan and had a clear picture not only of their own actions within the overall mission but also the sequence and procedure of teamwork and coordination. For this reason all Lt Col I. Shakel had to do was give a brief signal to execute the plan, which he did by radioing: "670, attack!"

Strike results were fully in conformity with the higher commander's general plan. The squadron received a mark of excellent for the tactical air exercise.

A two-ship element led by Maj G. Nikolayev was on roving patrol in an area in which "aggressor" aircraft were actively operating. The fighters were hugging the ground in order not to reveal their presence. The pilots had been in the air for quite some time, and they were gradually feeling the increasing stress of tension. That point was approaching when the fact of coming up empty on the sortie would become a psychological burden exceeding that of the most difficult but aggressive air engagement. At this point fortune smiled upon Maj G. Nikolayev's fighter pair. An aircraft appeared momentarily at some distance. It disappeared as suddenly as it had appeared, dissolving in the expanse of sky.

The two fighters headed for the spot where the "enemy" had appeared a few seconds ago. They were experienced combat pilots, and therefore their dash was not simply a move in hopes of contact but rather a calculated combat action. They took note of that airspace in which the "enemy" had appeared. They projected the target's movement. They made a hypothesis on the type of aircraft and mission which the adversary was performing. In short, an entire aggregate of combat situation indicators comprised that input data which the fighter pilots used to give their maneuver purposeful meaning.

Without going into detail on the incident, I shall merely state that Maj G. Nikolayev's element encountered a group of "aggressor" transport aircraft and successfully "shot down" several targets. The pilots were also heavily engaged by the fighters escorting the transport aircraft. Data recorder tape analysis indicated that on this mission the two fighters "shot down" four cargo aircraft and a fighter. It is true that Major Nikolayev was also "shot down." But the overall mark received for the sortie was excellent.

Here is another example. Capt I. Voloshin's helicopter section, while flying a mission, was ordered to "destroy" tanks in a ground combat area. Voloshin received the following radio reply to his inquiry about the status of "hostile" air defense: "We have no information. Figure on standard air defense system. Proceed as situation requires."

Captain Voloshin formed his section up into an extended formation in trail. He himself flew tail end, and he sent one aircraft out ahead, with instructions to conduct a kind of probing action or reconnaissance in force, with the objective of locating the air defense assets protecting the tanks. Soon the section reached the designated grid square. The lead helicopter commenced the attack. Air defense immediately made its presence known, but they were unable to get the attacking helicopter with antiaircraft weapons, since the range to target did not permit delivery of effective fire. Several seconds after the first helicopter, the three others hit the tanks from the same direction, through the same gap in the adversary's air defense system as the lead helicopter. The section's sortie was graded excellent.

What common features are to be found in these examples from actual tactical air exercises? In what way do they differ?

A common element is the fact that the element leaders had to make a combat engagement decision when already airborne. The uniqueness of specific situations is considerably greater than might seem at first glance. The superficial differences, although obvious (different missions, different force compositions and even different types of aircraft, specific modes of combat), nevertheless are superficial, because there are also stronger and, most important, substantial differences. It is these that we shall be discussing.

Thus in all three cases the element leaders were making a combat engagement plan. Such a plan always and invariably encompasses a certain mandatory set of substantial elements, whether the plan is laid out in writing with all particulars and details or whether it is concentrated in a single word: "Attack!" It always contains everything essential to ensure that the engagement is fought with awareness, in an expedient manner, and produces results.

All three element leaders incorporated all components in their plan. Herein lies their similarity. Otherwise the results of commander thought process might be anything, but not a combat engagement plan. There is something, however, that makes all three plans radically different. And this is a profound difference, pertaining to activity in the final seconds prior to combat engagement.

We should state that we are making no claim to penetrate into the mechanism of thinking. This is a matter for scientists and science. Our tasks and capabilities are more modest: carefully to examine our own experience and to share our personal reflections.

The following picture takes form. In the process of battle planning the combat pilot proceeds from three basic components: accurate data on the combat environment, assumptions with the assistance of which one completes the missing factors which are elements of the combat situation, and commander's volition, which ties together actual with presumed data and rejects any doubts caused by incompleteness and possible ambiguity of the information at his disposal.

In our view these components are always in the aviator's mind during combat planning and decision making, which is dictated by the very nature of combat. But the relative weight of each of these components varies, depending on many factors, but mostly on the most specific combat situation. The fuller and more accurate the information on the combat situation, the larger the contribution to the final decision and plan is made by rigorous calculation, verification, and logic. The less data available on the combat environment and situation, the greater the role played by assumptions and the greater the contribution of commander volition to the content of the combat engagement plan.

Based on the considerations enumerated above, we shall divide all possible combat decisions into three types: balanced, risk-taking, and cautious. I believe that distribution of the percentage share of accurate knowledge, assumptions and volition would be obvious in each of these categories. But let us return to our tactical air exercise examples.

Lt Col I. Shakel knew virtually everything about the "aggressor." Therefore his plan was worked out in detail prior to mission departure. The strike element leader essentially did not need any assumptions. Decision making did not require any special volitional effort. It was merely necessary to make sure that entry into the objective area was executed strictly in conformity with preliminary calculations and precisely to determine the moment of attack, which the squadron commander did. In this case it is legitimate to classify this as a balanced combat decision and plan.

The situation developed quite differently for the roving fighters. At that instant when it was necessary to make a decision (within a few seconds the very possibility to engage would disappear, as soon as the "aggressor" aircraft disappeared), element leader Maj G. Nikolayev knew literally nothing specific about the combat situation other than the fact that an "enemy aircraft" had momentarily appeared and that the fighters' mission was to exploit any opportunity to attack aircraft of the opposing force. Consequently, with information on the "enemy" which was very minimal in extent and very doubtful of reliability, principal responsibility rested on commander volition, which was based solely on assumptions.

Of course it was not blind will at work, but rather the volition of an experienced, professional fighter pilot. For this reason initiation of the attack was grounded on the element of surprise and swiftness of events, on a high-speed dash toward the projected target, whereby the presumed fighter escort would be unable to repulse the fighters' missile fire. After "killing" the first targets, the fighters would concentrate their joint efforts without delay on subsequent targets, but mentally they would already be preparing for aggressive defensive actions. They could not expect transport aircraft to be without escort. That would be an unprofessional assumption.

Immediately after launching their missiles, the two fighters abruptly broke away in order to look around and get a better idea of the situation. And they indeed were under attack by "aggressor" fighters, which were already close to a kill. Now only one realistic possibility remained—to reduce to a minimum the effect of the adversary's fire. This they accomplished. It would seem that the fighter element leader's decision and plan should be classified as risk-taking.

Finally, we shall analyze the engagement of tanks by Capt I. Voloshin's helicopter crews. The section commander knew the exact location of the strike objective, but he did not know the actual status of air defense in the battle area, although he could assume as a point of departure the standard system of engaging threat aircraft in such a situation.

But without obtaining more detailed knowledge of actual air defense capabilities, he could not simply make an assumption and initiate the attack. It was precisely for this reason that the section commander sent one of the helicopters out ahead for the purpose of bringing the air defense system to life. Subsequently, determining that the direction from which the scout helicopter flew its

strike run was comparatively safe, the section commander engaged his other aircraft. We would apparently be correct in classifying Capt I. Voloshin's decision and plan as cautious.

Some may consider the section commander's decision to be not the best. Particular question might be raised by the fact that he positioned himself at the tail end of the formation rather than himself acting as scout helicopter. In my opinion the element leader acted correctly. In the first place the crew of the lead helicopter might come under such heavy fire that they would be unable to estimate "enemy" strength, because it would be necessary to take decisive steps to evade air defense fire. Such an evaluation would be more accurate from a distance. This role was assumed by the element leader, taking position at the tail end of the formation. Secondly, the lead helicopter was looking for a favorable direction for the strike. If the direction turned out wrong, the section would still engage the tanks. Who would have it easier—the leader or the tail end? Most probably the leader, since the other helicopters would be fighting in conditions in which they were not helped by the element of surprise in entering the battle area.

Thus we have three combat decisions and battle plans: balanced, risk-taking, and cautious. Which of them is the best? In my opinion the type of decision and plan per se does not reflect its actual value, for the most important difference among these decisions lies not in their moral content but in the tactical factors involved. Lt Col I. Shakel made a balanced decision not because he was disclaiming risk but because he possessed reliable information on the "enemy." Maj G. Nikolayev took a risk not out of boldness or daring but because without risk (taking fire from escort fighters!) there would be no attack on the transport aircraft. In this case a risk-taking decision on the one hand was dictated by circumstances, while on the other hand it was the only possible decision. Capt I. Voloshin proceeded with caution not because he wanted to hit the tanks with total impunity but proceeding from the endeavor to achieve maximum results, which could not be achieved with the boldest but unwarranted risk. Particularly since tanks are a comparatively stable target, lacking the capability instantly to disappear from the battle area. Consequently the time expended on reconnoitering air defense assets did not threaten success of the air-to-ground strike.

Very simple conclusions proceed from this.

The value (acceptability) of a given type of decision is determined not only and not so much by moral considerations as by the specific features of the environment and situation in which combat aircrews are operating.

It would probably be useful for every military aviator to train his tactical thinking in making decisions of all types, and not only those enumerated above. Naturally such practice is engendered by the system of combat training, not by mere wishes or desires. And the number one task is to learn knowledgeably to utilize sober calculation, assumption, and volition.

As for the ethics of the combat aviator, they are quite simple: hit the enemy at all times, in all places, in all conditions, do not acknowledge a situation to be hopeless, and gain victory at minimum cost and with maximum combat effectiveness.

Fighter Regiment Trains, Familiarizes New-Arrival Pilots

91441096j Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 10, Oct 88 (signed to press 6 Sep 88) pp 20-21

[Article, published under the heading "For a High Degree of Combat Readiness," by Gds Maj V. Bazhenov, guards fighter regiment senior navigation officer: "Navigation Support of Flight Operations"]

[Text] A heavy rain squall, accompanied by distant rumbling of thunder, was approaching the airfield. An aircraft being piloted by Military Pilot 1st Class Gds Maj V. Dyuzhenko was far from its base. The tactical control officer therefore instructed the fighter pilot to proceed to an alternate airfield.

This situation did not greatly complicate things for the pilot. He possessed solid piloting skills and adequate proficiency in navigation. Having received the requisite information from the ground on heading, altitude, and point at which to commence initial approach descent, he proceeded with confidence, in spite of the suddenly-deteriorating weather. Experience helped him promptly gain his bearings in the developing situation and reliably ensure the fighter's flight safety while precisely carrying out ground instructions.

One could cite a great many similar examples from our regiment's daily activities. They confirm that personnel proficiency in navigation is one of the main implements of the professional skill and combat readiness of military aviators. Navigation training makes it possible continuously to increase one's knowledge of theory, to maintain and improve pilots' solid skills in navigation, search, vectoring to threat aircraft and ground targets, launching missiles, and destroying the potential adversary's modern offensive weapons. Such training is conducted for the purpose of mastering methods of skilled piloting of an aircraft along a specified route with combined employment of navaids and navigational instruments in combination with visual orientation, maintaining the requisite formations, arriving at a designated point with accuracy both in place and time, formation break, initial approach descent, and landing approach. Guideline documents prescribe that this training is to be organized by the regimental senior navigation officer, who structures

training taking into account knowledge and skills already acquired by the pilots, as well as combat training missions assigned to the air unit.

We generally begin improvement of navigation proficiency, consisting of ground and air training, with study of the flight operations area, navaids and airborne navigation avionics. Special attention is devoted to the younger pilots and recent graduates of higher military aviation schools for pilots, who lack substantial flying experience.

Engineer-pilots Lts V. Kovalskiy, N. Dyatel, V. Selyutin, and others recently reported for duty with our guards unit. Under the guidance of the squadron deputy commander they refresher-studied points of theory and the requirements of the Manual of Navigation Service, and then proceeded to familiarize themselves with the flight operations area, which in our case presents certain difficulties due to the limited number of prominent landmarks. In connection with this the training instructor, instructing the young pilots on the specific features of visual navigation, always selects the most typical linear and area landmarks and terrain features, river bends, and intersections of highways and rail lines, tying their location in with their home field.

We have for such training classes topographic, air navigation and other reference maps and charts of various scale, photomaps of the most important areas, and tables listing pertinent features of flight activities and climate. There is also a chart of the flight operations area on which all towns and villages are marked, but without names indicated. Pilots use this chart to practice precise identification of a town, railway station or freight yard, or platform-type rail station.

In studying the flight operations area, we endeavor to ensure that each young pilot has firm knowledge of the following elements: the general physical-geographic nature of the terrain, compass variation and magnetic anomalies, principal area and linear landmarks and terrain features, location of obstructions, climatic and weather peculiarities of the area, and local signs of change in the weather. The young pilots then take the tests for certification to take part in regular flight operations.

We organize pilot training strictly in accordance with the combat and political training schedule and taking into account the requirements of organizational-methodological instructions pertaining to the specific training period. We always utilize documents regulating flight operations safety during performance of training activities on the ground and in the air. The flight operations officer, each time after the regimental commander has given the briefing and task assignment for preparation for and conduct of flight operations, determines the nature and specific features of the flight operations shift, navigation support services, and determines the procedure and sequence of preparing the flight operations team as well as the command post team officers.

Navigation support of effective execution of the flight operations schedule plays an important role. It also contains the following element. Sometimes preparation of the flight operations schedule is delayed for various reasons. While this is not of great significance to the pilots (they know in advance what maneuver sequences they will be performing), it is very important that the tactical control officers receive training sortie schedule variations as quickly as possible, so that they can promptly determine the number of simultaneous guidance vectoring operations and the total number of aircraft which will be in the air. Here too it is not a bad idea for the senior navigation officer, together with the regimental chief of staff, to estimate the proper disposition of personnel at the command post by flight operations phases, to communicate the requisite information to the tactical air control team and, finally, to determine what equipment would best be used in controlling aircrews aloft. For this reason we thoroughly analyze every instance of delay in preparing flight operations schedules and other documents, and we make sure that specific solutions are adopted.

Individual self-training also plays an important role. Tactical control officers, for example, make navigation calculations in their notebooks for the maneuver sequences to be performed by the pilots and review safety procedures involving fighter operations in the stratosphere, at medium and very low altitudes. They must also be familiar with airspeed restrictions specified for a given type of aircraft and remember minimum prescribed fuel reserve for a fighter at various distances from its home field, as well as normal fuel consumption per kilometer and per minute, at various altitudes and in various flight configurations. The officers thoroughly study the presumed or likely air environment, refine and detail coordination procedures with the air traffic control team, and procedures in sending aircraft to an alternate field.

Navigation training classes are regularly held in the unit on the ground training schedule, in order to improve the professional skills of all flight personnel. For example, our pilots and tactical control officers studied such topics as "Using airborne navigation and targeting avionics for sure navigation"; "Independently determining one's position when airborne"; "Searching for ground targets by instrument"; etc.

Each month we hold instruction methods classes with the squadron deputy commanders and flight commanders to work out uniform methods of flight personnel navigation training. Such training classes usually precede performace of a specific training mission or simulated combat mission. For example, the topic "Calculating flight distance and duration" was studied just prior to the most recent tactical air exercise involving weapons

delivery at a distant air-to-ground range. This was a major factor in successfully accomplishing the assigned mission. As a rule we select complicated routes for training missions, involving a variable mission profile and several takeoffs. We have the pilots figure fuel consumption and the point of no return to their home field and their alternate. We give them a limited amount of time to make these calculations. We then check the correctness of their answers. If there are any discrepancies from the check figures, we immediately determine the cause of the error. No officer should be unclear on any item pertaining to navigation on such a cross-country flight.

Following instruction methods classes, brief drills on navigation procedures are held in the squadrons. Recently an interesting drill was conducted in the subunit in which Gds Maj V. Kabanov serves. The purpose of the drill was to test the knowledge and skills of flight personnel in proficient utilization of the integrated flight director system when flying a landing approach in instrument meteorological conditions. Questions asked involved determining by instrument readings the aircraft's position in relation to a landing approach path centered on the localizer and centering the localizer needle prior to intercepting the glideslope.

As practical combat training confirms, during ground navigation training it is essential regularly to conduct flight personnel practice sessions on the simulator and in the aircraft cockpit. I check out a given pilot according to the month's work schedule. I specify the following tasks: teach one's subordinate precisely to maintain the specified flight configuration and initiate a given target run precisely at the ETA.

On a preliminary preparation day I went over to the cockpit simulator and asked a young pilot to show me his flight plan, which he was to have prepared in advance. His flight plan was acceptable. I then took the instructor's seat, while the lieutenant continued flying the "fighter." Then, as prescribed by the plan, I informed the pilot: "One of your principal instruments has failed...." Now it was advisable to estimate ground track by heading, distance, and time. And the officer had to switch to flying by his backup instruments. This immediately had an effect on his "flying" performance, especially the landing approach. The pilot turned onto his final approach course at the incorrect distance out and with an incorrect heading, which rang a mental warning bell. When I checked another young engineer-pilot, he made the identical mistakes when I presented him with the same situation.

At this point I determined from talking with the young pilots that the squadrons had been devoting insufficient attention to training the recent pilot cadets in flying and shooting landing approaches on their backup instruments. We had to get to work immediately to correct the situation. I presented a proposal before the unit methods council, which at its next session examined the pilot instruction method being used for cross-country flying and flying a landing approach on the backup instruments. A uniform method was devised for performing flight assignments using a modern integrated flight director system.

Performance-graded cross-country flights in a fighter trainer with the canopy blocked by IFR blinds is highly beneficial in the development of young pilots. In our unit, prior to such flights the pilot trainee plots out his route without any time constraints. During preflight preparation he then refines his calculated navigation figures: drift angle, groundspeed, and other parameters. Immediately after takeoff he goes on instruments. On approaching an enroute waypoint he reports to the instructor pilot over the aircraft intercom: "Waypoint!" At this point the blinds are removed from the canopy glass, and both officers determine whether they have correctly reached the waypoint. Flight under the hood then continues. This makes it possible immediately to determine the seriousness with which the young pilot has approached an important training sortie and the quality of his preparation. The pilot gains firm confidence that quite soon he will be able to fly an actual mission in any air and weather environment.

In conclusion I should like to emphasize that if each commander works persistently in seeking new and improved forms and methods of navigation training for his men, he will without question achieve high, stable results in ensuring the subunit's operational efficiency and combat readiness. Practical experience confirms that one must consider all aspects of flight activities taking into account development of the potential adversary's equipment, weapons and tactics, and one must consider navigation training and all combat training within a dynamic framework, proceeding from the requirements of modern combat.

Pilot Responds Proficiently to In-Flight Emergency

91441096k Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 10, Oct 88 (signed to press 6 Sep 88) p 21

[Article, published under the heading "Flight Safety: Emergency Situation," by Honored Military Pilot USSR Col (Res) N. Gostev: "In an Emergency Situation"]

[Text] A pilot's calm voice came over the flight operations officer's speaker: Lt V. Mekh was requesting takeoff clearance.

"Cleared for takeoff," the tower controller responded.

The combat jet, smoothly lifting off the runway, streaked skyward. The maneuver sequence was not easy, but Mekh was sure that he could handle it, since he had prepared thoroughly for the training sortie. He therefore

proceeded with the advanced aerobatic maneuvers in a cool and deliberate manner. The lieutenant was unaware that on this day he would be put to a difficult test of courage, boldness, and professional skill.

Toward the top of a loop the pilot cut his afterburner, as prescribed. He now proceeded to cut power back to idle. But... he could not budge the throttle. One second passed, two seconds.... Mekh continued trying to move the throttle, but without success. At this point the realization came that the throttle was stuck in the maximum thrust position.

His airspeed was building up. It was necessary to take action. Any delay, not to mention indecisiveness and confusion, would only make the unexpectedly arisen situation more difficult to handle. The pilot, instantly assessing the situation, decided to continue execution of the descending portion of the loop with a higher G loading. Aware that airspeed would increase after the loop was completed, he extended his speed brakes and pulled back hard on the control stick, putting the fighter into a climb. This was necessary in order to keep from developing excessive airspeed.

"This is.... Altitude in practice area.... Airspeed in level flight.... Speed brakes extended.... Throttle jammed...."

Veteran flight operations officer Lt Col V. Chestnov received the lieutenant's detailed situation report. He immediately radioed back. assurance in his voice: "Initiate flameout engine restart!"

"Roger, restart initiated," Mekh immediately replied.

The flight operations officer and the pilot understood one another instantly. Both were well aware that following this procedure the aircraft's fuel system would automatically switch over to another operating mode. And this would make it possible to create favorable conditions for landing the aircraft.

On the flight operations officer's command, at the calculated distance from the runway threshold the pilot shut down his engine with the fuel emergency shutoff valve and skillfully landed the combat jet.

This emergency situation appeared suddenly and proceeded swiftly. There were literally only seconds to respond. But these seconds were enough for Lt V. Mekh to pass this in-flight emergency test with flying colors.

Hazards of Improper Dive Recovery Described

91441096l Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 10, Oct 88 (signed to press 6 Sep 88) pp 22-23

[Article, published under the heading "Flight Safety: Experience, Analysis, Problems," by Military Pilot-Expert Marksman Lt Col A. Kozlov and Lt Col A. Frolov: "At the Air-to-Ground Range"

[Text] One type of combat training involving simulated combat is training aircrews in the employment of various weapons on air-to-ground ranges. Maneuvering during the execution of such training missions involves substantial change in altitudes and airspeeds, G-loads and angles of attack, and also emphasizes the features of an aircraft's stability and controllability. All this naturally demands that combat pilots pay extreme attention to precision flying and that they rigorously observe flight procedures and regulations.

The most complex phases of maneuvering include aiming and breakaway after completion of an attack pass. Difficulties arise during a dive. If the dive is at an angle of less than 30°, the pilot does not experience any particular psychological or physiological stresses, but a higher-angle dive demands of the pilot a high degree of proficiency.

In the initial phase of a dive, as a consequence of the aircraft's unaccustomed attitude, the pilot has the impression that he is outside the cockpit, on the aircraft's nose, as it were, but cannot see the horizon. Required angles of attack decrease due to the rapid airspeed buildup. Therefore turning the aircraft onto the target requires a high bank angle and high G-load, which makes aiming much more difficult.

The pilot will also be unaccustomed to the ordnance release height and the process of dive recovery, where in the latter half of the dive recovery maneuver it seems that the aircraft is taking a long time to approach the horizon, and the pilot has a tendency to want to increase the G-load in order to ensure breakaway at a safe altitude.

Aircraft pullout or recovery following ordnance delivery is one of the most critical phases of maneuvering at an air-to-ground range from the standpoint of flight safety. As we know, altitude loss during this time, in wings-level flight, depends on airspeed, dive angle, and load factor. The pilot must constantly monitor airspeed and engine operation, especially when entering a dive at high airspeeds. Otherwise airspeed may increase beyond Mach 0.9, whereby in the process of dive recovery with deceleration there occurs spontaneous increase in load factor by 1-2 G's (G-force "pickup"). The limit load factor can be exceeded as a consequence of this.

Attacking a ground target, Sr Lt S. Kholmov put his aircraft into a 22 degree dive from an altitude of 2,000 meters, indicated airspeed 720 km/h, at full throttle. He failed to reduce engine rpm during the dive, which led to a substantial airspeed buildup.

He launched his ordnance closer to the target than usual. As a result, in order to keep from descending below minimum safe altitude, he was forced to execute a more abrupt dive recovery. He initiated dive recovery at Mach 0.9 by pulling back abruptly on the control stick, which led to intensive deceleration, resulting in G-force "pickup" and an increase in load factor beyond 10.

In order to prevent an aircraft from approaching too close to Mach 1, airspeed prior to initiating dive recovery from an altitude of 1,000 meters should not exceed 1,000 km/h indicated. With dive recovery initiation at a higher altitude, indicated airspeed should be reduced by 25 km/h for every 500 meters.

If a pilot has failed to prevent excessive airspeed buildup, the period of high G-load during dive recovery should extend for not less than 2 seconds, and the load factor should be 1 G less than the limit load factor permitted for the aircraft's external-stores ordnance loadout.

Dive recovery at low airspeeds is no less hazardous. When diving at an angle of 10-15° at reduced throttle (less than 90 percent), speed buildup does not exceed 100 km/h in a period of 10 seconds. If dive entry is executed at low airspeed or if dive brakes have been extended, an excessive angle of attack is possible during recovery at the recommended G force. The aircraft becomes G-force unstable, and vigorous manipulation of the controls can result in spontaneous overswing to an excessive angle of attack.

In order to avoid this, it is necessary to establish a load factor of 4, with aircraft gross weight approximately 14 tons, at an indicated airspeed of not less than 725 km/h. With an increase in gross weight of 1 ton or increase in load factor by 1 G, airspeed should be increased by 25 and 100 km/h respectively.

The magnitude of angle of attack overswing depends to a significant degree on the rate of angle of attack swing. If the pilot manipulates the controls fairly smoothly, approach to the zone of instability is detected by decrease in aircraft resistance to increasing the load factor. In this case the pilot can prevent a dangerous increase in angle of attack (G force) by promptly reducing rearward force on the control.

With abrupt manipulation of the controls, when the recommended G force is generated in one second or less, a 4-6° angle of attack overswing occurs due to inertia. Aircraft entry into load factor instability takes the pilot by surprise and as a rule leads to a further increase in angle of attack, with subsequent stall.

A training sortie by Sr Lt M. Stachev is typical from this standpoint. As he was flying a third target run, this pilot made a mistake, increasing his dive angle to 38°. He was late in initiating dive recovery, at an altitude of 450 meters and an indicated airspeed of 760 km/h. He pulled the controls back half-travel in 0.2 seconds and held the controls 0.3 seconds in this position, after which he pulled the controls almost full aft in 0.6 seconds, and then allowed the controls to move somewhat forward....

A trim angle of attack of 12° corresponded to the initial control stick deflection, but the flight data recorder tape showed a 15.8° angle of attack, that is, an overswing of 3.8° due to the high rate of stabilator deflection. This was subsequently confirmed by in-air experimentation.

A trim angle of attack of 21.5° corresponded to the second position of the control stick, but the flight data recorder tape indicated a continuous increase in angle of attack even after the control stick moved forward. This is due to the fact that, as a consequence of angle of attack overswing, the aircraft entered a zone of G-load instability (onset of stall "pickup"), in which spontaneous increase in angle of attack took place, right to the point of stall.

In order to prevent an aircraft from exceeding the maximum allowable angle of attack and to reduce the harmful effect of inertial forces, establishment of dive recovery G load should be performed over a period of not less than 2-3 seconds.

Just prior to initiating dive recovery, the pilot should bring his wings level and place the rudder pedals in a neutral position. There are two reasons for this requirement. First, if the wings are not level the lift component in the vertical plane decreases, which leads to an additional loss of altitude during dive recovery. With a wing angle of 15°, for example, altitude loss during recovery from a 20° dive at an indicated airspeed of 950 km/h, at 4 Gs, will be 15 meters, while altitude loss will be 70 meters with a 30° dive, and 220 meters with a 45° dive. Second, with an increase in angle of attack during dive recovery, there is also an increase in rolling moment with a slip component due to increase in the aircraft's lateral stability. The slip indicator ball moves toward the center with an increase in G force, creating the false impression that there is no slip or skid component. It is difficult to counter the aircraft's tendency to increase wing angle, since lateral control efficiency diminishes substantially at high angles of attack, while rudder roll control effectiveness increases.

If the wings are not brought level prior to initiating dive recovery, and if for this reason vigorous banking commences during the process of dive recovery, the pilot must immediately bring his rudder pedals neutral and briefly (for 1-1.5 seconds) reduce the load factor to 2-3 Gs, at the same time bringing his wings level, after which he can increase the G force to the recommended load factor.

This aerodynamic peculiarity occurred on a training sortie flown by Capt S. Zhukov. Upon reaching the range the pilot located his target and initiated a descending attack pass, with a sustained left turn and slip. He initiated dive recovery after firing his rockets, in a slipping, wing-high configuration (the control stick, with an increase in angle of attack, was deflected to the right, initially two thirds of full travel, followed by full deflection, and during this entire time the left rudder pedal was applied one fifth of full travel). The aircraft exceeded the maximum angle of attack, with onset of stall entry. Contributing to stall onset was a slip, which at high angles of attack and insufficient aileron effectiveness prevented the pilot from bringing his wings level.

Analysis of flight data recorder tapes from air-to-ground range training missions indicates that when maneuvering to avoid taking fragments pilots frequently exceed a load factor of 5 Gs during dive recovery. An increase in G force above 5 at dive angles of 20-30° does not substantially decrease loss of altitude during dive recovery. For example, while during recovery from a 20° dive at a true airspeed of 900 km/h, altitude loss runs 150 meters with 5 Gs, altitude loss is 125 meters at 6 Gs, that is, the decrease in altitude loss is only 25 meters, although the G force has increased substantially. One must bear in mind that generation of substantial G forces without entering stall conditions is possible only at high indicated airspeeds.

If aircraft dive recovery is followed by an evasive air maneuver with vertical and horizontal component, the pilot should initiate a bank only after full dive recovery.

The above-examined peculiarities of aircraft behavior, stability and controllability during maneuver, especially at high angles of attack, provide grounds to conclude that they substantially affect flight safety. Pilot knowledge of these peculiarities will help prevent pilot errors and errors in weapons delivery on ground targets.

Aerial Refueling Procedures

91441096m Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 10, Oct 88 (signed to press 6 Sep 88) pp 24-25

[Unattributed article, published under the heading "Into the Military Airman's Arsenal": "Aerial Refueling"]

[Text] **Pilot, Remember!**

Aerial refueling procedures require of aircrews a high degree of proficiency, psychological firmness, and confidence in successful accomplishment of the procedure.

As the aircraft approaches the refueling drogue from its initial positioning point, the pilot's emotional stress increases and reaches a maximum at the moment of contact. The pilot should monitor his own state of stress and periodically relax.

An unwarranted endeavor to accomplish immediate probe-drogue contact shall not be permitted, especially during one's first few aerial refuelings The pilot should complete only those contact attempts successful accomplishment of which is not in doubt.

An attempt to accomplish precise aim at the beginning of movement forward from the initial positioning point leads to excessive shaking of the aircraft and failure to accomplish contact. Precise aiming of the refueling probe tip into the center of the drogue shall not commence until closing to a distance of 1-2 meters.

At slow rates of closing, the drogue latching devices do not fully engage the tip of the refueling probe, which results in fuel spillout.

At high approach rates the UPAZ servo system is unable to accomplish reel-in, and a hose "arc" forms which, if throttle reduction is delayed, can result in a snapping or lashing action, breaking the refueling probe head at a weak point.

Safety Procedures

If the hose begins to whip, the pilot shall immediately reduce throttle, down to idle if necessary, extend his speed brakes, and disconnect.

If the aircraft begins shaking in the immediate vicinity of the drogue, the pilot shall reduce throttle and, moving the control stick forward, while maintaining wings level, drop to a position 3-4 meters below the refueling hose drogue. The pilot should then bring his aircraft steady and repeat the probe-drogue approach-to-contact procedure.

The tanker crew shall closely monitor the weather in the refueling area and avoid entry into clouds.

In case of unintentional entry into clouds, the pilot of the aircraft being refueled shall immediately disconnect.

Probe-drogue approach-to-contact shall not commence until the procedure clearance lights indicate go-ahead.

Methodological Recommendations

A pilot should train for midair refueling operations by flying as wingman in close formations.

During dual flight training the pilot shall practice all aerial refueling procedure elements and shall undergo psychological training for the performance of midair refueling.

The pilot should approach the refueling hose drogue from below, in order to eliminate or maximally to diminish the aerodynamic effect of the nose section of the fuselage on stabilization of the fueling drogue in the airstream.

When in the initial approach position, the pilot shall fully trim his aircraft.

When flying in the immediate vicinity of the refueling drogue, at the moment of drogue-probe contact, and following contact, the pilot shall refrain from abrupt and large movements of the aircraft and engine controls. Lateral drift shall be corrected with the control stick; the pilot shall not use the rudder pedals.

During a pilot's initial training flight to master aerial refuling procedures, the pilot shall not endeavor to accomplish a large number of drogue-probe contacts on a single flight. The pilot will inevitably gain a high probability of success in contact attempts as he gains experience in performing aerial refueling procedures.

A pilot shall not be permitted to practice night aerial refueling procedures until he has acquired solid skills in accomplishing daylight drogue-probe contact.

Weather-Related Static Electricity Hazard to Aircraft

91441096n Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 10, Oct 88 (signed to press 6 Sep 88) pp 32-33

[Article, published under the heading "Flight Safety: Specialist Advice," by Research Engineer Maj S. Balakin: "Aircraft and Static Electricity"]

[Text] The weather did not seem to indicate any problems that day: cloud bases were at 400 meters, and cloud tops at 800 meters (the radar showed weak precipitation echoes). And reports from aircrews aloft indicated that there were no hazardous weather phenomena. Nevertheless the unforeseen occurred.

As he was flying a landing approach, Military Pilot 1st Class Maj A. Gromyko saw on the tip of his pitot head a luminous sphere the size of a tennis ball, which moved closer to the cockpit and grew in size as the aircraft descended. A light-blue flickering light lit up the instrument panel. Then there was an explosion in the cockpit. The pilot, who sustained point burns on his skin, was able to land the aircraft. Military Pilot 1st Class Capt Yu. Mayakov encountered similar conditions. After takeoff, during climbout, he saw a glow on his pitot head. This was followed by a powerful electrical discharge, which disrupted radio communications and damaged his performance and navigation instruments....

We could cite many such incidents. They became particularly frequent as new-generation aircraft entered service, aircraft which were much faster and which had gained all-weather capability.

Just what is the phenomenon of buildup of static electricity on an aircraft? Buildup of a static electric charge occurs when aircraft are flying in a certain meteorological environment. Elements of cloud and precipitation (drops of water, snowflakes), during friction against the surface of an aircraft, receive an electric charge, while the aircraft receives an electric charge of the opposite polarity. The larger and faster an aircraft is, and the greater the quantity of particles of moisture contained in a unit volume of air, the greater the electric charge will be. Static electricity occurs in the form of a glow on the wingtips, at the tips of protruding antennas and other sharply tapered or pointed structural elements, in the form of ball lightning and sparks on the cockpit glass. Frequently it disrupts normal operation of avionics. If large electrical fields have formed in the cloud in which an aircraft is flying, it can also be struck by an atmospheric electrical discharge—lightning. Resulting physical damage to dielectric fairings can result in fragments entering the engine and disabling it.

The nature of this phenomenon has not been fully studied. One difficulty lies in the fact that this is a combined problem—static electricity builds up only in interaction between aircraft and the surrounding medium and is manifested variously, depending on conditions.

So-called zones of heightened electric charge buildup can occur in stratocumulus, stratus, or nimbostratus clouds with vertical development from 1 to 5 km. In external appearance these are darker cloud-cover zones. As a rule they produce low and medium-intensity returns on radar. In the winter and transition seasons they frequently produce precipitation.

An electric charge is produced in any type of cloud as a result of interaction between cloud and precipitation particles and an aircraft's skin surface. Under normal conditions this charge leaks off by means of discharge currents promoted by the conductivity of the air and the stream of the engine gases, while leakage via corona discharge currents at elevated potential occurs via pointed or tapered projections on the aircraft. The greater the aircraft's speed and surface area, the more intensively this process takes place. When flying in clouds containing zones of elevated electric charge buildup, an aircraft takes on an electric charge which sometimes runs as high as several million volts.

The electric charge effect depends to a great extent on the material of the aircraft's external covering in the zone of contact between atmospheric aerosols and the aircraft surface. As experiments have shown, the least effects of

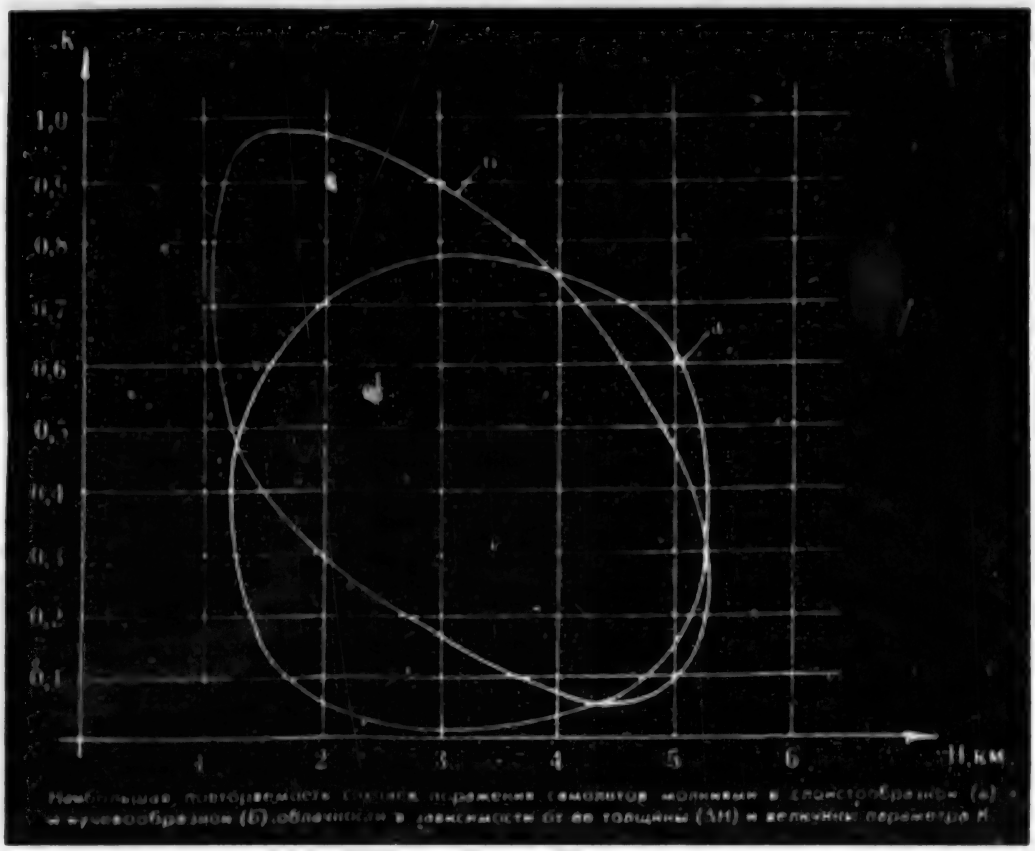
static electric charge are observed on purely metal surfaces. Application of a dielectric paint coating sharply increases electric charge buildup.

Aircraft dielectric structural elements are also subject to intensive electric charge buildup when flying in clouds of various type. As a consequence of intensive charging of fairings and difference in conditions of discharge between aircraft skin and fairing surface, a difference in potentials develops, which is determined by flight conditions. With intensive electric charge buildup, this leads to the occurrence of electrical discharges (similar to surface discharges on cockpit glass, which are particularly noticeable when flying in clouds during hours of darkness). As a rule this takes place in the immediate vicinity of various avionics receiving antennas and is a source of interference across a broad band of frequencies.

Combined measures of a technical (protection against the effects of atmospheric electricity) and an organizational nature are required to prevent instances of aircraft being damaged by discharges of static electricity and to increase flight safety. Technical measures include installing radome protection and effective static discharge wicks on aircraft, applying on aircraft surfaces paint coatings resistant to electric charge buildup, plus installation of airborne equipment to provide warning of zones of hazardous atmospheric static electric charge buildup.

Based on the results of an analysis of the circumstances of damage sustained by aircraft, the Air Force weather service specified a number of indications on the basis of which one can determine the possibility of existence of zones of elevated electric charge buildup in clouds and recommended that they be taken into consideration when planning and executing flight operations. These indications are characterized by the presence in the area of flight operations of stratocumulus, cumulus, and nimbostratus-altostratus clouds, various precipitation, passage of a front (with the exception of warm fronts), the trailing edge of a low-pressure system, a low-gradient transition area between low and high pressure, a warm area of a low-pressure system, and a ground-adjacent temperature contrast along a cold front, when the temperature contrast does not exceed 5°/500 km and the front is not moving faster than 40-50 km/h. It is also important to consider the following points: the trailing edge of a low-pressure system, a region of low pressure, a warm area of a low-pressure system, a trough of low pressure, and a diffused elevated-pressure field are observed at the 850 millibar level.

Greatest Frequency of Instances of Damage Caused to Aircraft by Lightning Strikes in Stratiform (a) and Cumuliform (b) Clouds, in Relation to Vertical Thickness of Cloud Buildup (H) and Value of Parameter K



Entry into the region designated on the graph for stratiform and cumuliform clouds is an indicator of zones of intensive electric charge buildup in clouds. The coordinates of the points are determined from the values of cloud formation vertical development ΔH and parameter K, which is calculated with the formula K=H-5°-Hhb/Hht-Hhb, where H-5° is the altitude of the isotherm; hb is altitude of cloud bases, and ht is altitude of cloud tops.

In using this diagram one should bear in mind that for nimbostratus clouds vertical development should exceed 2 km.

Hazardous zones of electric charge buildup are also indicated by temperature at nimbostratus cloud tops if it is below -70° and temperature at stratocumulus cloud tops if it is below -10° C.

It is determined that zones of intensive electric charge buildup may occur when all the above-enumerated indicators are present. Radars can be used to determine their location within clouds.

Using weather radar, zones of intensive electric charge buildup are seen as bright areas on radar displays (vertical bars on the IDV [expansion unknown], individual cells or groups of cells on a PPI), in which maximum echo return lgZ exceeds 1.0 for nimbostratus-altostratus clouds and exceeds 0.5 for stratocumulus clouds. When using centimeter-band ATC terminal radar, these zones are detected by the presence of medium- and high-intensity returns on radar displays operating in weather mode.

In determining altitudes of zones of intensive electric charge buildup, one should bear in mind that damage to aircraft by static electricity discharges in nimbostratus-altostratus clouds takes place for the most part in the lower half of the cloud layer, and in stratocumulus clouds—in the upper half.

Performance of the indicated measures and utilization by supervisory and flight personnel of recommendations on ensuring flight safety in conditions of potential electrical discharge hazard to aircraft will greatly reduce the probability of such damage occurring.

U.S. Military Policy in Latin America Castigated

91441096o Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 10, Oct 88 (signed to press 6 Sep 88) pp 38-39

[Article, published under the heading "Imperialism—Enemy of Peoples, Progress, and Freedom," by Candidate of Historical Sciences Col S. Zenin and Maj V. Ovsyannikov: "Under the Pentagon's Helmet"; based on materials published in the foreign press]

[Text] **We are not forgetting about the threat to peace on the part of imperialist militarism and believe that irreversibility of initiated positive processes is not yet guaranteed.**

From the proceedings of the 19th All-Union CPSU Conference

* * *

Five years ago, in October 1983, a single small word thundered across the world—Grenada. At that time the U.S. Air Force reconfirmed its notorious reputation as an instrument of imperialist aggression. U.S. aircraft not only transported interventionist troops to this island but also delivered bomb and rocket strikes on the meager patriotic forces.

The political passions which in recent months have blazed up around Panama, a small Latin American state, have once again reminded people about this bitter "anniversary." The events in Panama and on Grenada cast a focused light on U.S. policy in the Westen Hemisphere and the unsavory role played by the U.S. military in implementing the expansionist plans of the ultrarightist forces of imperialism. In an instance of rare candor the magazine U.S. NEWS AND WORLD REPORT stated: "Over the course of almost 150 years U.S. military forces have invaded Central America and the Caribbean on more than 60 occasions for the purpose of toppling governments, putting acceptable regimes into power... and protecting the interests of U.S. business."

In the middle third of the 19th century Mexico became the first victim of expansion by its "big neighbor to the north." More than one half of this country's territory was forcibly detached. One after the other practically all countries in Latin America and the Caribbean were subjected to armed brigandage by the United States. The mid-1980's were characterized by new U.S. actions under the banner of a strategy of neoglobalism against the revolutionary-liberation movement of peoples. A significant role in implementing this strategy is assigned to a system of military bases in Latin America, with the U.S. Air Force playing a leading role by virtue of the geography of the region and the scale of deployment of U.S. forces. Creation of a powerful military fist by imperialism in this region is due to a number of reasons of an economic, political, and military-strategic nature.

Latin America comprises for the United States an economic market and a source of raw materials. For example, U.S. monopolies control industry, agriculture, communications, and transportation. U.S. banks and monopolies have made large investments in the economy of the countries of this region in the form of loans and credit. The aggregate indebtedness of the countries of Latin America in 1987 was estimated at 400 billion dollars, the bulk of which comprises debt to the United States.

No less important to Washington, however, is the need to maintain in this region a political status quo favoring the United States. The example of Revolutionary Cuba inspires peoples to fight for social equality and national independence. In these conditions U.S. military bases

serve as strongholds of counterrevolution and reactionary dictatorships. It is not mere happenstance that the United States maintains substantial forces in the Panama Canal Zone. There are 77 U.S. military installations and bases in the Canal Zone, as well as headquarters of the U.S. Southern Command, an inter-American air force academy, various mercenary training schools and training courses, and 14,000 U.S. military personnel are stationed in the Canal Zone. Salvadoran pilots receive training at a U.S. air base in the Canal Zone, where they are trained in employing phosphorus and napalm against the liberation movement in the region.

The oldest U.S. air base outside the United States is at Guantanamo Bay, situated on the territory of socialist Cuba. It has played and continues to play a sinister role in the business of crushing revolutionary actions by the peoples of Latin America which are fighting for their freedom and independence. Provocational and intelligence-gathering flights over Cuba and the other countries of the region continue to be flown from this air base. There have been reports in the press that the United States has also employed aircraft in acts of "economic aggression against Cuba," involving the deliberate burning of sugar plantations and aircraft. U.S. aircraft have sprayed chemicals, causing draught or heavy rains over vast areas of Cuba. According to the newspaper GRANMA, more than 450 modern fighter-bombers are permanently deployed in the proximity of Cuban shores. The United States maintains 3 aircraft carriers in the waters of the region.

Citing official sources, the NEW YORK TIMES reported: "A number of proposals to take direct military action against Cuba have been submitted to President Reagan and his senior advisers on national security affairs for their consideration."

The U.S. neocolonialists are turning El Salvador and Honduras into large military staging areas directed against the national liberation movement in the region. With the consent of the regimes in power, the Pentagon is modernizing existing air bases and building new ones in these countries under the guise of "assistance." As reported by the NEW YORK TIMES, several airstrips in Honduras have been rebuilt and upgraded to be able to accommodate C-5A aircraft delivering arms, as well as all types of fighter aircraft. The WASHINGTON POST reported that the Pentagon is closely studying the possibility of building nine airfields in Honduras. Construction of these airfields would increase U.S. military intervention in this country to an even greater extent. In the 1980's, thanks to active U.S. support of the armed forces of Honduras, the military potential of this country has increased appreciably. According to the estimates of Western military circles, the Honduran Air Force is presently the most powerful air force in Central America. It possesses more than 230 fixed-wing and rotary-wing aircraft of various types. Honduras has been receiving fighter aircraft from the United States since December 1987.

U.S. imperialism, which is being given control of air bases and is supplying vast quantities of arms (the United States has provided Honduras, for example, with 86 fighter-bombers), is constantly maintaining tension in the region and is threatening Nicaragua, a country which is carrying out radical democratic reforms and is implementing an independent, peace-seeking foreign policy.

Within the framework of the annual U.S.-Honduran maneuvers code-named Big Pine (the largest and most extensive military exercises in this region in the last 20 years), U.S. aircraft and aircraft of the U.S. puppet governments in Honduras and El Salvador fly regular reconnaissance missions and intrude into the airspace of revolutionary Nicaragua for provocational purposes. The Nicaraguan Ministry of Foreign Affairs reports, for example, that under the pretext of conducting military maneuvers, four military aircraft similar to those in service with the Honduran Air Force penetrated Nicaraguan airspace and overflew a number of border areas of the department of Nueva Segovia. Another aircraft, bearing no identifying markings, which also came from the directoin of Honduras, strafed the Nicaraguan island of Cordon with rocket fire.

These incursions and attacks into Nicaraguan territory by unidentified aircraft appear particularly suspicious in light of a West German Parlamentarisch-Politischer Pressdienst report about a plan devised by the Pentagon. The report reads: "As an initial phase, it is proposed to bomb various installations in Nicaragua, with the attacking aircraft bearing no identifying markings. After this, right-wing rebel forces, wearing Sandinista army uniforms, would stage an attack on a Honduran village. With this they plan to fake a Nicaraguan response to the bombing attacks. Following this 'incident' Honduras would declare war on Nicaragua and simultaneously request military assistance from the United States...."

History contains incidents of this type. For example, a provocation involving an "attack" on a German radio transmitter site by Hitlerites disguised in Polish uniforms served as a pretext to invade Poland. As we see, the methods used by provocateurs have remained unchanged.

It is stressed in the foreign press that as soon as the Nicaraguan Government declared its determination to finish off the Contras and mercenary bands once and for all, Washington provoked this year's "March crisis" in Nicaragua. The U.S. Air Force took direct part in a show of military force. The 82nd Airborne Division, notorious from the invasion of Grenada, took part in this "action to intimidate the Sandinistas" under the pretext of a field exercise, being airdropped into Honduras, while U.S. F-5 aircraft suddenly appeared in the sky over Nicaragua, coming from the direction of Honduras, and attacked with rockets Sandinista army positions near the village of San Andres de Bocay.

We must also mention another form of expansion of U.S. imperialism: the giving of so-called "aid" to Latin American countries, aid which reflects to a considerable degree the faithfulness of a given government to its alliance with the United States. U.S. financial assistance is always accompanied by preliminary conditions. In particular, such conditions include restriction of contacts with the "communist camp," granting financial benefits to the United States, and permitting the U.S. military-industrial complex to use the region's strategic resources. According to foreign sources, for example, the United States is now de facto totally in control of Easter Island, having transformed it into an ideal base of operations for carrying out its aggressive plans to militarize space. The air base built by the Pentagon can be used for space shuttle landings. Construction of facilities on the island is continuing, and there are plans for future operational facilities for attacking targets in space.

Of the great variety of Pentagon "assistance" in the area of combat training, the press emphasizes the transfer of "knowledge," "know-how," and the "art" of killing by U.S. Air Force people to the military in El Salvador and countries with pro-American regimes. This "assistance" is being rendered to the accompaniment of noisy propaganda about "the fight against terrorism" and essentially supports the bloody dictatorships in El Salvador, Guatemala, and Honduras, with the objective of cobbling together a reactionary anti-Cuban, anti-Nicaraguan bloc and of giving an appearance of "collective actions" to an aggressive policy. In those countries, however, persons striving for freedom and progressively-thinking persons are considered terrorists. It is they who become the victims of these bandit attacks.

For example, under the guise of a campaign against terrorism, the Salvadoran military, with the aid of U.S. combat helicopters, subjected agricultural areas in a number of departments to barbaric bombing attacks. Hundreds and thousands of innocent people have perished.

The world was stunned by the monstrous crimes committed by Salvadoran military aircraft along the border with Honduras, where 1,500 civilians were driven into a cave and then subjected to aerial bombing according to all the procedures which had been taught by Pentagon "specialists." The cave was turned into a gigantic common grave. Nobody was able to escape. We could cite a great many examples of brutal actions by reactionary-regime pilots who were led and trained by U.S. Air Force personnel.

U.S. imperialism, with its arrogance and claims to an alleged "legitimate right" and "moral duty" to control the world, also played the principal role in the Falklands events. In 1982 Great Britain unleashed a colonial war against Argentina over the Falkland Islands (Malvinas) virtually on behalf of and with the actual participation of the United States. As was reported in the press, the U.S. Air Force worked in active coordination with the British Air Force in this military adventure. The Royal Air Force received from the U.S. Air Force prompt and timely intelligence on the location of Argentine naval forces, and U.S. Air Force heavy transport aircraft airlifted equipment, fuel, and arms for British air and ground forces.

In March of this year, on the eve of the sixth anniversary of the commencement of the armed conflict unleashed by the two countries, the situation in the region once again became sharply deteriorated. Great Britain, using a U.S. base on Ascension Island in the mid-Atlantic as a transshipment point, operated hand in glove with the United States in militarist war games code-named Fire Focus. The Pentagon wishes to maintain a permanent British military presence on the Falkland Islands (Malvinas), since this enables U.S. strategists to use these islands as an important strategic base of operations. Meriting attention is the opinion of noted Argentine expert on military problems N. Seresole, who believes that these islands may be used for the U.S. "Star Wars" program and can serve as a springboard for deploying "rapid deployment forces" to any part of Latin America and Africa, as well as for other military purposes.

We must stress that aircraft stationed at the majority of air force bases in the continental United States, capable of carrying both conventional and nuclear weapons, have a radius of action sufficient to present a threat to the national liberation movement of the peoples of Latin America. U.S. air bases abroad are positioned in such a manner as to control key areas of the Western Hemisphere.

It was noted at the 19th All-Union CPSU Conference that external imposition of a social system, way of life, and policy by any means, including military, is a dangerous accoutrement of past years. To oppose freedom of choice means to oppose the objective course of history. This is why a policy of force is all its forms and manifestations is doomed to failure. The march of history cannot be halted.

SARSAT Satellite-Assist Search and Rescue System Reviewed

91441096p Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 10, Oct 88 (signed to press 6 Sep 88) pp 44-45

[Article, published under the heading "The Space Program Serving Science and the Economy," by Lt Gen Avn (Res) Yu. Kravtsov, Lenin Prize recipient: "Search and Rescue System"]

[Text] More than 10 years have passed since the first formal agreement was reached between the USSR, Canada, the United States, and France on commencing the establishment of an experimental orbital system for

determining the location of ships and aircraft in distress. This system was designated KOSPAS-SARSAT. Both the Russian and the English acronyms signify "search and rescue using satellites."

The number of participating countries increased rapidly as the system was being established and after results were obtained which confirmed the system's considerable capability. Great Britain, Norway, Brazil, Bulgaria, and other countries have joined the ranks of the system's users to date.

Establishment of this system became possible thanks to experience in operating navigation satellites, which were in particularly widespread maritime use. Nor is this surprising, for determination of the location (coordinates) of a vessel in distress is a purely navigational problem, with the sole difference that this information is needed not by the vessel's crew but by the search and rescue service.

Indeed, if a directional fix is taken, at several points in a satellite's path, of a signal emitted by an emergency locator beacon, and if the location of these points is sufficiently well known and they are "tied in" to a common precise time, then by measuring the Doppler frequency shift caused by the satellite's motion relative to the source of the distress signal, and after performing appropriate calculations, one can determine the coordinates of the emergency locator beacon.

These calculations are fairly complex and require relatively high-performance computers. For this reason calculations are performed on the ground. Measurement results are directly relayed to a ground receiving station (NPPI) located within the satellite's line-of-sight, and if there is no ground station within line-of-sight, measurement results are temporarily stored aboard the satellite.

Obviously in order to guarantee that distress signals will be received, it is essential that satellites radio-frequency monitor the earth's surface. If a satellite is orbiting at an altitude of 800-1,000 km, its line-of-sight encompasses a circular area approximately 6,000 km in diameter; consequently full coverage of the polar regions can be accomplished with a set of four satellites.

Before acquainting the reader with the KOSPAS-SARSAT international satellite system which is currently in regular operation, we shall discuss why the system was developed.

Every year approximately 400 vessels, representing a total displacement of two million tons, perish in the world's seas and oceans as a result of shipwrecks, fires, and collisions at sea. We also know that 25-30 of these vessels go down without anybody hearing a distress signal.

Figures for air transportation are similar, but they are larger by an order of magnitude, for the total number of aircraft takeoffs and landings in a 24-hour period runs to several hundred thousand.

Statistics indicate that the chances of survival for victims of an air mishap are 50 percent if help arrives within the first 8 hours and drop off to 10 percent if help does not arrive within 48 hours. The situation is similar in the case of a mishap at sea. For this reason satellites, which are capable of reducing the time it takes to rescue survivors, today play a primary role in performance of this noble mission.

According to the official figures of the International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO), vessels and aircraft equipped with emergency locator beacons carry approximately 1 million persons each year. It is also interesting to note that emergency locator beacons are increasingly becoming an equipment item for geologists, topographers, and private individuals, who have become apprised of the capabilities of the satellite search and rescue system.

Just what is an emergency locator beacon? According to the initial agreement by representatives of the four countries, each party is to develop independently its own emergency locator beacons (ARB) and emergency distress signal transmitters (APB) to provide to aircraft and vessels. The only thing in common is the transmitting frequency—121.5 MHz. To date there are more than 350,000 of these devices.

Soviet industry is series-manufacturing Poisk-B emergency locator beacons and Poisk-R emergency distress signal transmitters, weighing 2.2 and 1.8 kg respectively, plus the R-855UM emergency handheld aviation transceiver and various versions of this transceiver. Muscovites and visitors to the capital can acquaint themselves with these products at the Space Pavilion at the Exhibit of Achievements of the Soviet Economy.

These devices, designated ARB-121, share a specific feature: just as in the case of SOS signals, someone must hear their transmission. In other words, finding crash victims depends for the most part on volunteer monitoring of the international emergency frequency for distress signals. If one bears in mind that emergency locator beacons were developed without considering the possibility of their utilization in satellite systems (transmitter power, duration of transmission, frequency stability), it becomes clear that the "volunteer" system of detecting persons in distress is insufficiently effective. Upon establishment of the international satellite system, however, the decision was made to take maximum consideration of the possibility of detecting signals emitted by these emergency locator beacons. Incidentally, during the initial phase of operation of the KOSPAS-SARSAT system,

when only a single satellite was in orbit—Kosmos 1383—a distress signal was picked up from an ordinary crash locator beacon on an airplane which had gone down in Northern Canada.

In order to render immediate, effective assistance it is desirable to know the following: Who is in distress? What is the nature of the emergency? What are the immediate needs of the distress victims? This is why specialists have proceeded with the development of next-generation locator beacons which are specifically designed to be used in the satellite-based system.

Since the frequencies around 121.5 MHz are heavily used for other purposes, a special frequency—406 MHz—was assigned for emergency locator beacons of the new type. This locator beacon has been designated ARB-406. It weighs 4.5 kg. The ARB-406 emits a distress signal every 50 seconds after switching on, for a period of 48 hours. The transmitted information makes it possible to determine whether the signal is coming from an airplane or a ship, to determine the aircraft's or ship's nationality, the type of emergency, the amount of time which has passed since the emergency situation began, the identification number of the aircraft or vessel, and the presumed site of the crash.

The accompanying drawing shows the basic operating principle of the KOSPAS-SARSAT system [drawing not reproduced]. Signals from an APB or ARB are picked up by one of the system's on-line satellites and relayed to a ground station, where the signals are processed. The appropriate national search and rescue services are then informed of the crash or distress situation via system headquarters. We should note that ARB-121 signals are immediately relayed via satellite to a ground station, without processing or storage, that is, simultaneous line-of-sight bewteen locator beacon, satellite, and ground station is required. Determination of the coordinates of the crash site is accurate to within 10-20 km. A single satellite can simultaneously receive and relay signals from 10 emergency locator beacons within line-of-sight of the satellite and a ground station.

The system operates somewhat differently with the ARB-406. First of all, the satellite carries a special computer which determines the Doppler frequency shift caused by the relative motion of the satellite above the emergency locator beacon, on the basis of which the emergency locator beacon's location is calculated following additional processing at a ground station. Secondly, additional information contained in the signal is separated out. Third, transmission frequency, time received, and extracted message are real-time transmitted to earth and stored in the satellite's onboard computer, and are subsequently "dumped" on command by the closest ground station.

Since ARB-406 locator beacons transmit a more powerful and more stable signal and operate in a less heavily-used frequency band, probability of signal detection is 95 percent, and determination of crash location is accurate to within 5 km.

Ground receiving stations are located on all continents and are interconnected by permanently-operating communication links. Therefore information transmitted from a satellite passing overhead is immediately processed (the coordinates of the emergency locator beacon are determined, as are its nationality and the code indicator specifying nature of the emergency and required assistance) and is immediately passed on to the country to which the aircraft or vessel in distress belongs, for appropriate measures to be taken, pursuant to current international treaties.

The decision currently in effect stipulates that up to 1990 four satellites will be operating at all times in the KOSPAS-SARSAT system: two are to be provided by the USSR, and two by the SARSAT participant countries.

More than 1,000 persons have been rescued with the system's assistance since it has been in operation. It has proven so successful in special tests that a ski expedition from the USSR to Canada via the North Pole, led by D. Shparo, used an ARB-406 as one of its principal means of navigation. We should note that the expedition took place during the polar night in conditions of poor visibility and, as we know, a magnetic compass is unreliable at the North Pole. A second ARB-406 (with another code number) was kept for use in an emergency.

Thus space hardware has acquired another noble profession—to render prompt and timely assistance to persons in distress.

In conclusion we should note that in 1986 the International Maritime Organization made the decision to use the KOSPAS-SARSAT system and to equip all seagoing vessels with an ARB-406 in coming years, while the International Civil Aviation Organization is completing its review of the possibility of employing this system in aviation. In the future an international distress communications system will be established.

Cause-and-Effect Diagram of Physical Discomfort, Impairment During Flight

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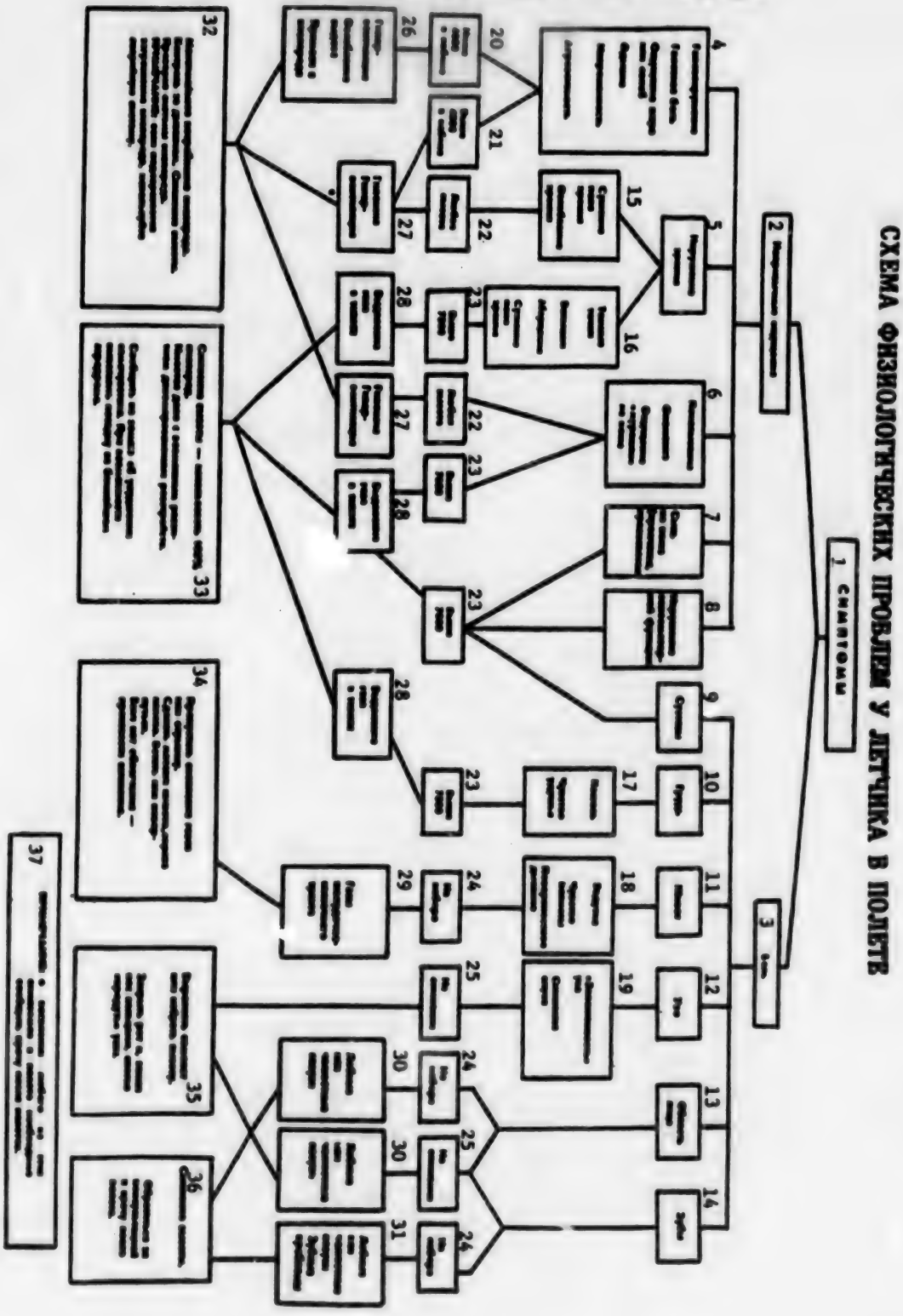
[Article by Lt Col Med Serv V. Varfolomeyev, candidate of medical sciences: "If One Feels Sick During Flight"]

[Text] Every pilot knows what to do if an aircraft equipment malfunction occurs. But many aviators have no idea what to do if they begin to feel sick while in the air. The purpose of the following diagram, constructed according to the principle of interlinkage of symptoms of physical discomfort, change in flight conditions, and measures to be taken, is to help pilots understand how to respond.

Diagram of Pilot Physiological Problems During Flight



Key:
1. Symptoms
2. Unaccustomed sensations
3. Pain
4. Dizziness, headache, sensation of fever or chill, shortness of breath, tension, aggressiveness
5. Impairment of vision
6. Prickly or tingling sensation, numbness, "skin crawling" sensation
7. Skin rash (spotty, reddish)
8. Impairment of sensorimotor function
9. Joints
10. Chest
11. Abdomen
12. Ear
13. Facial area
14. Teeth
15. Narrowing of vision, weakening of vision
16. Dark spots, flashes, flickering, narrowing of vision
17. Coughing, feeling of asphyxia
18. Flatulence, feeling of fullness, shallow breathing
19. Plugged ear, diminished hearing
20. Below 4,000, in cockpit
21. Above 4,000, in cockpit
22. Any altitude
23. Above 7,000
24. While climbing
25. While descending
26. Hyperventilation, weakening of exhalation, impurities in oxygen
27. Hypoxia, hyperventilation
28. Release of gas in tissues
29. Gases in gastrointestinal tract
30. Sinuses
31. Sinuses, tooth problems
32. Maximum consumption of oxygen. Monitoring of breathing. Descend to lower altitude. Check oxygen system. Note: if oxygen contamination is suspected, use emergency system
33. Descend to lower altitude—breath 100 percent oxygen. Possible development of decompression disorders. Report feeling sick to ground. If possible, land at nearest airport
34. Pass accumulated gases or belch. Massage abdomen, right to left. Stand up or turn body. If there is no relief, descend to a lower altitude
35. Establish level flight or climb. Close mouth and, clamping nose with fingers, lightly "pop" ears
36. Descend to lower altitude. Consult physician after flight
37. Note: If any of these symptoms occur during flight, this must be reported to physician after flight operations

How does one use this diagram?

First of all one must determine how change in one's state of physical well-being is expressed: in the occurrence of unusual sensations or in development of pains. Unusual sensations can be manifested in the form of impairment of vestibular function, impairment of vision, respiration, skin sensitivity or motor function. If pains occur, their location must be determined.

After determining the initial sympton, one must find the corresponding box in the upper part of the diagram. Then one proceeds downward along a vertical line to specify where it occurred (altitude, descent, climb). One then determines the causes of the discomfort and determines measures to correct them.

If, for example, vision has become impaired, this may be caused by hypoxia or hyperventilation, regardless of altitude. In this case the recommendation is maximum oxygen consumption, monitoring of respiration depth and rate, checking of the oxygen system for proper functioning, and descent to a lower altitude.

The sequence of actions if pains occur is established in similar fashion. Let us assume that there is abdominal pain. Attendant symptoms include shallow breathing and a full-stomach feeling. If this occurred during climb, the pains are caused by expansion of gases in the gastrointestinal tract. Recommended measures include abdominal massage, standing up (if possible) or turning the body. If this does not bring relief, one should descend to a lower altitude.

Obviously this diagram fails to cover all situations which may arise during flight, but the principal causes of physical discomfort and response measures are included. For more effective utilization of the recommendations incorporated in the diagram, it is advisable to discuss the contents of the diagram together with a flight surgeon.

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